12-18-2014

Digital Finger Painting: A Qualitative Exploration of the Tablet Computer and its Artistic Implications in an Early Childhood Setting

Sarah Nicole Ackermann
University of Missouri-St. Louis, sarahcress@gmail.com

DIGITAL FINGER PAINTING: A QUALITATIVE EXPLORATION OF THE TABLET COMPUTER AND ITS ARTISTIC IMPLICATIONS IN AN EARLY CHILDHOOD SETTING

by

SARAH NICOLE ACKERMANN

M.A., Art Education, University of Illinois, Urbana-Champaign, 2006
B.F.A., Art Education, University of Illinois, Urbana-Champaign, 2005
B.F.A., Photography, University of Illinois, Urbana-Champaign, 2005

A DISSERTATION

Submitted to the Graduate School of the

UNIVERSITY OF MISSOURI-ST. LOUIS
In partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

in

EDUCATION IN TEACHING AND LEARNING PROCESSES
with an emphasis in Art Education

December, 2014

Advisory Committee

E. Louis Lankford, Ph.D.
Chairperson

Karen Cummings, Ph.D.

Margaret Cohen, Ph.D.

Carl Hoagland, Ph.D.

Abstract

The purpose of this study was to better understand the implications of the tablet computer for learning and, specifically, in the art classroom. A qualitative study was designed following grounded theory measures for data analysis in order to explore timely questions regarding the tablet computer and how young children react to such technology as a drawing tool. An early childhood center was accessed for this research, and 30 children between the ages of three and five years old consented to participate. Four educators and 35 parents were also enlisted in an effort to elicit substantive perspectives regarding the tablet and its artistic potential. Children were observed as they drew on an iPad® tablet and digital drawings created were compared to those made with crayons on paper. Additionally, collaborative art making with the tablet computer was encouraged, and children completed digital drawings in pairs. Semi-structured interviews shed light on what children enjoyed about the tablet computer as well as what they disliked about the technology. Parent and educator perceptions regarding the tablet computer as a learning and drawing tool were gathered through brief survey data and one-on-one interviews. Findings have been detailed through participants' stories and documented thematically.

Keywords: iPad®, tablet computer, digital art, artistic development, drawing, preschool children, early childhood

Acknowledgements

There have been many educators who have influenced this research. I thank all of those who shared their expert knowledge with me and helped shape me into the researcher I am today. Particularly, I would like to thank my committee members including Dr. Karen Cummings, Dr. Carl Hoagland, and Dr. Margaret Cohen for their mentorship, patience, and time. Each of these individuals spent countless hours meeting with me, reading my work, and providing feedback. It is because of their critique that this document has evolved into a dissertation I can be proud of. I must also thank my committee chair, Dr. Louis Lankford, who went above and beyond as a doctoral advisor. His never-ending wisdom laced in wit, his thoughtful yet direct criticism, our mutual love for cupcakes, all of these attributes and more helped me through the ups and downs that come with pursuing such a degree. I am so fortunate to call these four individuals colleagues and partners in crime.

I would also like to thank those family members and friends who served as my constant cheerleaders during this endeavor. There were my parents and siblings who regularly asked when I was scheduled to finish the "giant paper." There were also my friends who reminded me to relax and recharge every once in while. Finally, there was my husband Kevin who encourages me every day to do what I love. It is because of his support, in so many ways, that this pursuit was possible and now accomplished.

Finally, I would like to thank the participants involved in this study. Those educators who participated reminded me on a weekly basis what excellent teaching should look and feel like. There were also the children involved, so energetic and full of life, who pushed me in my endeavors while also making my task fun and fulfilling.

Table of Contents

List of Tables

List of Figures

Digital Finger Painting: A Qualitative Exploration of the Tablet Computer and its Artistic Implications in an Early Childhood Setting

Chapter One: Introduction

During the summer of 2006 I accepted my very first teaching position. Fresh out of a master's program, I was not unlike other beginning art educators. I was ready to tackle the world and help others find their deep down passion for the visual arts. I was young, energetic, and idealistic.

I found myself at a suburban high school west of Chicago. As the new photography teacher in the building administrators directed me to my very own classroom complete with four desktop computers and a fully stocked darkroom. I spent the next four years in that classroom modifying lessons and my instructional approaches according to each class of unique students. Over time I began to notice preferences among my adolescent pupils. There were the darkroom enthusiasts who only wanted to spend time with negatives and chemicals. Then there were the digital enthusiasts who were drawn to using Photoshop® software and digital manipulation. I was fascinated by my students and how they expressed their preferences with such assertiveness.

By the time I made the shift in 2010 to pursue my doctoral degree some teachers had begun to experiment with smartphones and similar technologies in the classroom setting using them in exciting, meaningful, and productive ways. No longer were these devices considered methods of distraction. They were now learning tools. Thinking back to my high school students, particularly the digital enthusiasts, I decided to investigate technology and, specifically, the tablet computer given its rising popularity in academia

and beyond. I began with a small interview study in order to learn how leaders in the field of education defined tablet computers and their academic implications, particularly within the art classroom. A qualitative study was designed and an interview protocol was developed in order to ask adult educators and researchers their opinions regarding tablet computers. From this small study (see Appendix A) I learned that the tablet can potentially enhance learning in significant ways, and that further research in this domain would shed additional light on the topic. Thus began formal preparations for my current line of research.

Considering that many high school, middle school, and even elementary school students may currently own tablets, or similar devices like smartphones, I wanted to investigate the purest possible population and their responses to technology in an academic setting. I decided to focus on preschool aged children because while they may have been introduced to touchscreen technologies, cell phones and tablets are not necessarily revered as objects of desire compared to older children. This is because few children preschool age and younger own their own devices, and instead rely upon adults or older siblings for access. Given my background in the visual arts I also wanted to explore the tablet and its potential role in the art classroom. After considering my selected age range and desired topic of interest I decided to introduce the tablet computer as a drawing tool to preschool aged children.

Statement of Problem

Today's children have an additional hurdle to jump. They have been called digital natives, the net generation, and Millennials (Prensky, 2009, 2010; Tapscott, 1998). The pressure is so high for today's youth to not only learn how to read, write, and add, but

they must also be responsible for learning an entirely new language. This language is digital in nature and encompasses all of the tools one would see if touring the technology department of the nearest superstore.

Literature regarding technology and education claims that the digital native is alive and here to stay (Prensky, 2001, 2009, 2010; Tapscott, 1998). Such a native has been described as someone born into a technologically rich society. As such, this native is assumed to maintain the skills for navigating technology and the Internet at large in earth-shattering ways. Tracy Mardigian (n.d.) writes that, "access to technology is considered as integral to the 21st century classroom as textbooks, if not more so" (para. 8). If this is true today's educators are presented with the added challenge of providing such technology, learning how to use such tools, and brainstorming ways to utilize them in meaningful and powerful ways.

Promoters of technology in education, who use terms like digital native and digital immigrant, sometimes make broad assumptions regarding today's populations because they believe that today's youth are wired for such tools (Prensky, 2009, 2010; Tapscott, 1998). As such, they often forget some of the larger issues that can arise when integrating technology into classroom environments without significant planning and preparation. Issues may include different levels of access, a need for technical support, lack of knowledge on the part of the educator, insufficient support among other educational partners, or superficial integration into existing curriculum. Technology must be handled carefully and systematically. Today's technologies, like the tablet computer, must be considered tools, which in combination with a variety of experiences and methodologies address the needs of diverse learners.

Such sensitivity is important to consider among all ages of students, including those presumed as developing digital natives. The preschool classroom, like other levels of development, is not immune to the growing pressures to incorporate technologies regularly. While there is much to explore in the way of technology and preschool aged children, this study remained focused in its intentions. This study explored technology, specifically the tablet, and its artistic potential among early childhood.

Purpose of Study and Research Questions

The primary purpose of this study was to compare how children draw with a tablet computer opposed to traditional art materials, specifically, crayons on drawing paper. Throughout this exploration I considered how young children utilized the tablet computer as a drawing tool, whether or not children exhibited preferences in the technology as opposed to traditional art materials, and how they approached the tablet as a collaborative creation tool. I accessed three preschool classrooms for the purpose of investigation. I collected drawing artifacts, facilitated semi-structured interviews with children and educators, and gathered survey data from parents and educators. All of these steps helped me in deciphering how three to five-year-old children react to a tablet computer when engaged in drawing activity. I believe that such evidence highlights the implications of tablet computers in the early childhood classroom and, specifically, the art classroom setting. My research took on a basic qualitative approach using grounded theory methods of data collection and analysis. Some quantitative data was collected from teachers and parents in order to gain critical background information regarding previous technology ownership and use. The following research questions framed my line of inquiry.

1. What prior knowledge do children have regarding tablet computers and similar technologies?
2. How may drawings created on a tablet computer show evidence of a child's artistic development?
3. How do children draw on a tablet computer compared to traditional media, like crayons on drawing paper?
4. How do children navigate a tablet computer when drawing in pairs?
5. Do children exhibit preferences in drawing tools? Do they prefer the tablet computer over traditional media such as crayons on drawing paper?

Theoretical Framework

Victor Lowenfeld published the first edition of *Creative and Mental Growth* in 1947, an influential book within the field of art education. Within this work Lowenfeld described the stages human beings undergo while developing artistically. Lowenfeld and Brittain (1987) believed that through the study of children's artwork adults can gain a sense of the aesthetic, social, intellectual, and emotional growth of those creating the marks. Lowenfeld and Brittain provide a valuable framework for my line of inquiry, and I summarize their work in the pages following. I also discuss the work of Al Hurwitz and Michael Day (2007) and the writings of Rhoda Kellogg (1969) who provide additional insights regarding this domain. Together, these researchers provide a working understanding of artistic development, which is pertinent to my investigation.

According to Lowenfeld and Brittain (1987) "children draw in predictable ways, going through fairly definite stages, starting with the first marks on paper and

progressing" (p. 37). Young children between the ages of two and four "begin drawing by making random marks on paper. This stage is usually referred to as the *Scribbling Stage*" (p. 37). The phase to follow is known as the preschematic stage, which usually begins around four and lasts until about seven. Children at this age "draw the typical head-feet representation of a person and begin to draw a number of other objects in their environment with which they have had contact" (p. 39). These children are eager to talk about their work during and after the drawing process.

The schematic stage of development begins around seven and may last until nine years of age. In this stage children display an interest in the organization of objects on a page, usually along a horizon line at the bottom of their drawing paper. Following this stage comes dawning realism, other times known as the gang age. Beginning around the age of nine and lasting until about twelve years old drawings "symbolize rather than represent objects" (Lowenfeld & Brittain, 1987, p. 39). These children are detail oriented and less eager to share their work with others. As such, "their artwork reflects their greater consciousness of themselves as part of society" (p. 39). It is around eleven or twelve years of age that children enter the pseudo-naturalistic stage, also coined the stage of reasoning. Children at this stage experience "a great deal of self-criticism" (pp. 39-41). For some children, the pseudo-naturalistic stage represents the end of artistic growth and exploration.

Al Hurwitz and Michael Day (2007) present a simplified explanation of artistic development involving just three phases compared to Lowenfeld and Brittain's five. These include a manipulative stage, symbol making stage, and preadolescent stage. The manipulative stage takes place between ages two and five when "children manipulate

materials, initially in an exploratory, seemingly random fashion," and then later on become "increasingly organized" (Hurwitz & Day, 2007, p. 46) in their use of tools. During the second phase of development, the symbol making stage from six to nine, "children develop a series of distinct symbols that stand for objects in their experience" which "are eventually related to an environment within the drawing" (pp. 46-47). Other key characteristics seen in this stage include the development of more sophisticated storylines during creation, experimentation with negative space, and a greater sense of schema.

During the preadolescent stage, ages ten through thirteen, "children become critical of their work and express themselves in a more self-conscious manner" (Hurwitz & Day, 2007, p. 47). Hurwitz and Day note that "the physical, mental, and social changes that occur during these years set preadolescent children apart from younger children in the symbol-making stage" (p. 59). While "preadolescent children are still naturally inquisitive and creative, they have learned to be more cautious" (p. 59) and "their interest in art moves from using it solely for personal expression to consciously improving the quality of visual forms" (p. 63). It is because of this great concern for realism and even greater concern of peer opinion that this stage often sees a decline in artistic production, much like Lowenfeld and Brittain states in their pseudo-naturalistic stage.

The work of Lowenfeld and Brittain and Hurwitz and Day overlap in many ways. Another important figure who builds upon these two philosophies, and also this framework, is Rhoda Kellogg. Through the collection of over one million children's drawings, ages two through eight, Kellogg (1969) provides additional understandings, specifically regarding the experimental marks children make within the first two stages of

Lowenfeld and Brittain's theory of artistic development, as well as Hurwitz and Day's manipulative stage and the beginnings of the symbol making stage. Kellogg refers to these stages within stages as basic scribbles, placement patterns, emergent diagram shapes, diagrams, combines, aggregates, mandalas, suns, radials, humans, and early pictorialism. Kellogg (1969) identified patterns in young children's work, which included twenty different possible markings and various compositional decisions. Young children, according to Kellogg, begin with initial scribbles and experiment with patterns. From these early investigations children begin to explore diagrams, incorporating geometric and organic shapes into their renderings. Kellogg writes that it is within the phase of combines, and further, the phase of aggregates, in which children begin combining two or more diagrams or shapes to create a range of visual ideas and relationships. The stage of radials follows, in which circles along with various other basic scribbles emerge. This evolves into suns and radials where the shape of a circle often acts as a focal point with markings that emerge along the outskirts of the circular form or, simply, lines transcend from one convergent point. These preliminary marks inevitably lead to representational human figures composed of circular bodies and stick appendages. From these early and seemingly basic renderings of the human form further detailed drawings featuring other life encounters surface. Through these markings Kellogg (1969) suggests that even the youngest of children use forethought when deciding which areas on a blank page to utilize for marks, and that as a "child scribbles on a blank paper, the paper yields a new visual stimulus" (p. 23). As the child "continues to scribble, the total image-blank spaces as well as markings-continues to change, and the child responds to the new configuration as he draws" (p. 23). While Lowenfeld and Brittain and Hurwitz

and Day provide overarching descriptions of artistic development Kellogg provides a deeper examination of how the youngest of children create.

Since this study involved preschool aged children general understandings of artistic development were required, along with specific discussion concerning how the youngest of children mark. The work of Lowenfeld, Brittain, Hurwitz, Day, and Kellogg provide important background and context for understanding the drawings produced during this research. It is important to note though that while technology played a minimal role during the development of the theories previously discussed, today it is pervasive. Perhaps by aligning these theories of artistic development through a contemporary lens we may begin to understand the implications modern day tablet computers may have on children's artistic development.

Background and Context

As personal computing devices continue to become smaller and more sophisticated it becomes harder to distinguish what tools should be used, when, and for what purposes. Additionally, many schools throughout the country are adopting such technologies for use among children of all ages. It is thus important to maintain a common definition of what a tablet computer is and how it came to be.

The modern tablet computer offers a compact size, power, and countless applications to explore. Today's tablet computer is the product of years of experimentation and its history is complex, as it involves the evolution of personal computers as well as mobile computing. As I have discovered in my own exploration of the topic, today's tablet represents a hybrid device, borrowing elements of laptop computers, personal mobile devices, as well as smartphone technologies. This is

significant to my course of study because it was assumed that participants would be familiar with tablet technologies because of their close resemblance to smartphones. Like tablets, smartphones are increasingly purchased. At the same time, tablets offer several of the computing abilities available through traditional computers. I highlight several key technologies below to illustrate how intertwined the histories of such devices are.

It was during the 1960s, when computers were rapidly becoming compact and faster, that the idea of a personal computer emerged. Around this same time, the concept of the tablet computer also began to take root. Jesse Schedeen (2010) provides a comprehensive history of the tablet and its evolution. He writes that in 1968 Alan Kay created a plan for a tablet computer called the Dynabook. With children in mind, Kay envisioned a "portable computer with a nearly unlimited power supply that could be used as an educational tool" (Schedeen, 2010, para. 6). While the Dynabook may have never graced store shelves Kay's vision is considered one of the most powerful forces to drive continued interest in tablet technologies.

In 1985 the Penpad® computer was introduced and, while crude and bulky in design, this computer model took one step towards mobile computing with its touch-based input system (Schedeen, 2010). In 1989 GriD Systems® became the first company to produce a truly portable tablet-based computer weighing just over a pound. Apple® took a less active role in exploring tablet technologies until 1992 when the company unveiled a personal device called the Newton®. Throughout the early 1990s companies continued to introduce tablets for consumer use. IBM® brought the ThinkPad Moniker®, among others, and AT&T® introduced the EO Communicator®, which boasted the added perk of a wireless connection (Schedeen, 2010).

During the later part of the 1990s development of tablet computers slowed down and in their place personal digital assistants rose in popularity among consumers. Palm Pilot® devices graced store shelves as did models from other companies like Dell®, Sony®, and Compaq®. By 2001 the tablet computer concept was revisited and Bill Gates introduced the Windows XP Tablet Edition®. The most groundbreaking element of the device was its operating system. Dawning the current version of Windows XP® programming this new tablet promised the look and functionality of a computer with a touch screen interface (Schedeen, 2010). Tablets from various manufactures began saturating the market.

Throughout this time smartphone technologies were also becoming increasingly sophisticated. In 2007 Apple® introduced the popular iPhone® which, in partnership with Fingerworks®, adopted a multi-touch technology. By 2010 Apple® introduced their intentions to expand the tablet market with the iPad®. In a way, this device bridged the gap between smartphones and laptop computers, offering the same interface and multi-touch capabilities as a smartphone, but with a larger screen. Since its introduction the iPad® tablet has undergone several updated versions, as have other tablets produced by competing manufacturers.

The population of adults and children who access smartphone and tablet technologies grows each year. Even those families who may not possess a computer at home may own handheld devices like smartphones or tablets. With incredible ease and with a quick swipe of the finger even the youngest of children are able to operate such tools. Ensuring such an easy learning curve is likely the result of a field of study specializing in how we as humans interact with technologies. Known as the Human-

Computer Interaction, or HCI for short, researchers in this domain specialize in how people utilize machines in sophisticated and productive ways.

Current technologies, like the tablet computer, represent a variety of complexities and human involvement (Karray, Alemzadeh, Saleh & Arab, 2008). This human involvement is measured on three levels: "physical, cognitive and affective" (p. 139). "The physical aspect determines the mechanics of interaction between human and computer" and "the cognitive aspect deals with ways that users can understand the system and interact with it" (p. 139). The affective aspect "tries not only to make the interaction a pleasurable experience for the user but also to affect the user in a way that make(s) the user continue to use the machine" (p. 139). As technologies continue to evolve and become more sophisticated "there is increased interest among motivational and cognitive scientists in ways computers can be used to advance students' metacognitive and self-regulatory processes" (Bruning, Schraw & Norby, 2011, p. 227) and perhaps in the world of academia. With such increased interest "research suggests that well-designed computer programs not only can produce deep learning outcomes but also can scaffold such metacognitive processes" including "goal setting, elaborating information, and monitoring learning progress" (p. 227). In order for technology design to be strong it must take into account how our cognitive system works as well as how complex cognitive skills develop. When design is strong it "works with, rather than against, our cognitive systems, promoting active processing but not overloading working memory" (p. 228). When conditions are right, good technology can be used as a tool for learning. The question then is how do we define good technology, and is the tablet

computer an example of good technology? I intend to contribute an answer to this question with this study.

Operational Definitions

In the previous section I discussed the evolution of the tablet computer in connection with other similar digital devices. I also touch upon Human-Computer Interaction and the field of study that looks at such technologies and their influences upon how we, as humans, operate in conjunction with such tools. This discussion helps frame several working definitions for my readers. In the following pages, additional terms pertinent to my line of inquiry are defined.

Aesthetics – E. Louis Lankford (1986) defines aesthetics as a process of "asking questions and searching for answers about the nature of art" (p. 49). He further details that, "an important part of understanding aesthetics is learning to accept its gray areas, living with alternative answers to single questions, viewing what it offers with a critical eye, and making decisions" (p. 49). Aesthetics is concerned with "how art is valued and what is worth valuing, the rightness of critical decisions and soundness of reasons, and the implications of judgments" (p. 50).

Artistic Development – Children's artistic development is characterized by a series of stages in which a child progresses from scribbles to more sophisticated renderings. Through analysis of children's drawings, one may be able to discern the aesthetic, social, intellectual, and emotional growth of those creating the marks. Theories of artistic development, specifically those conceptualized by

Lowenfeld and Brittain (1987), Hurwitz and Day (2007), and Kellogg (1969) serve as the theoretical framework for this line of research.

Conception - Conception is "derived from experience" and involves "identifying, sorting" and "organizing verbal and mental language labels for things" (McFee, 1970, pp. 252-253). Combined, perception and conception provide a basis for intellectual growth in which one's "ability to experience, to think about what he experiences with language and mental images and then symbolize these to communicate to others" (p. 252) matures and evolves.

Culture – June King McFee (1970) defines culture as "the pattern of living among a given group of people" which is accumulated through "shared values, beliefs, and opinions on acceptable behavior" (p. 26). Culture is comprised of "education, religion, science, art, folklore, and social organization" (p. 26). The term culture may be used to describe a large society or a small group of people.

Cultural Change – Cultural change is a response to changes in perception, which in turn, impact cultural beliefs and values. As we, as individuals, encounter new sensory information, new concepts, and new experiences, our interpretations of the surrounding world and the behavior of others are modified. When our choices in what is important evolves, cultural change can take place (McFee, 1970).

Digital Immigrant – Marc Prensky (2001, 2009) defines digital immigrants as those who have adopted technological tools later in life. These adults were not born into a digital age and therefore not necessarily fluent in digital language.

Digital Native – Prensky (2001, 2009, 2010) defines this population as technologically savvy. These individuals are fluent in a type of digital language needed to interact with computers, other technological devices, and the Internet at large.

Perception - Perception involves the processes of "identifying, sorting" and "organizing visual information and remembered images" (McFee, 1970, p. 253). Combined, perception and conception provide a basis for intellectual growth in which one's ability to experience, reflect, symbolize, and communicate matures and evolves.

Tablet Technology –A tablet computer is a thin, compact touchscreen device. With the swipe of a finger, or with the use of a stylus, the user can browse the Internet, access and create presentations and word documents, compose photographs and video, play games, and create drawings. For this line of research a Motorola Xoom® tablet was first introduced. Shortly after the beginning of the study an Apple® iPad® tablet was accessed and used for the remainder of the investigation.

Technology – The term technology can refer to any viable tool that can be used for a specific purpose or solve a particular problem. Technology is considered a "scientific or industrial process, invention, method, or the like" (Technology, 2013). Within the context of this line of inquiry, the technology to be explored is the tablet computer.

Traditional Media – The term traditional media refers to materials regularly used in an art classroom setting. These include drawing pencils, erasers, crayons, paint, pastels, paper, canvas, and clay. For the purpose of this study traditional media will refer specifically to crayons and drawing paper.

Study Overview

I collaborated with a Child Development Center located on a mid-sized Midwestern university campus for this research. After receiving IRB approval, the permissions of the Child Development Center's director, educators (see Appendix B), parents (see Appendix C), and children (see Appendix D) inquiry began with the distribution of two surveys. One survey (see Appendix E) was intended for parents in order to gauge their prior experiences as well as their children's prior experiences with tablet computers and other similar devices. Additional questions involved art making experiences in the home. The second survey (see Appendix F) was intended for educators. Questions were designed to gather background information regarding educators' prior experiences with tablet computers and similar devices, and their thoughts regarding use of such tools in the classroom. Final questions considered how educators engaged their students in art making and the types of drawings they have seen from children. Following the collection of survey results I frequented the center weekly to observe educators and children in action, and to gain a sense of the center's environment.

Over time I began to negotiate with educators when to introduce the tablet computer to child participants. This began the formal portion of my study in which I worked one-on-one with children as they sat before a tablet computer using a basic paint application to create digital drawings. I explored children's interactions with the tablet through four phases. Phases one through three took three months to complete, averaging three visits per week, and phase four took one month to complete. During phase one children drew on the tablet computer one at a time under my supervision. During phase two I engaged children in collaborative opportunities in which they were invited to draw

on the tablet with a peer. During phase three children were given the choice to draw on the tablet or to draw on paper with crayons. Phase four involved semi-structured interviews with children regarding their art making experience (see Appendix G) in addition to three focus group discussions (see Appendix H). This phase also included one-on-one interviews with educators concerning tablet technologies and their implications in the preschool classroom (see Appendix I). Table 1 summarizes my research steps in a graphical form. Additional detail concerning my participants and methodology can be found in chapter three of this document.

Timeline	Research Phase	Data Collection
Week 1	Distribution of consent forms Distribution of parent and educator surveys General observation	Observational field notes, analytical memos
Week 2	General observation Collection of educator and parent surveys	Observational field notes, survey data, analytical memos
Week 3	General observation	Observational field notes, analytical memos
Weeks 4-6	Phase one: One-on-one tablet time	Observational field notes, digital drawings, videos of children working, analytical memos
Weeks 7-9	Phase two: Collaborative tablet time	Observational field notes, digital drawings, videos of children working, analytical memos
Weeks 10-12	Phase three: Measurement of preference	Observational field notes, digital drawings, traditional drawings, videos of children working, analytical memos
Weeks 13-14	Phase four: Interviews with children	Videos of interviews with children, interview transcripts, analytical memos
Week 15	Phase four: Interviews with educators	Audio recordings of interviews, interview transcripts, analytical memos

Table 1. Procedural Steps

Assumptions

Prior to embarking upon this line of inquiry several assumptions were acknowledged and addressed. I assumed that I would be able to accurately interpret the digital and traditional drawings of children in a meaningful way. Additionally, it was assumed that I would interpret transcripts documenting semi-structured interviews with children and educators clearly and accurately. Third, it was assumed that I would reflect regularly on my position as a researcher, acknowledging the ways in which I may influence study results based upon my own prior biases and classroom experiences.

As a means of keeping such assumptions at the forefront of my research several measures were taken. I regularly showed children their digital drawings in an effort to elicit candid conversation about the digital art making experience. I also shared such work with educators to gather information regarding the accuracy of my initial interpretations, specifically if children were in the scribbling stage or the preschematic stage of artistic development. Through discussion with child and adult participants I was reaffirmed when questions of researcher interpretation rose. Additionally, I requested feedback from peers who further evaluated the effectiveness of my research steps and interpretations. This valuable feedback was gathered during informal conversations in which I shared preliminary findings in a round-robin environment where two to three peers looked at my work analytically, asked questions, and made suggestions. I also maintained a detailed audit trail of the study experience, complete with analytical memos. Such memos housed regular reflections concerning my role as the researcher, evolving perceptions of the data I was collecting, and initial and final analyses.

Remaining assumptions involved children, parents, and educators. It was assumed that many of the children studied had some level of experience working with a tablet computer or a similar device, such as a touchscreen phone. With this, it was assumed that an introductory period in which children needed to become familiar with the tablet would be minimal in scope. Similarly, it was presumed that many of the parents and classroom educators involved would have some level of experience working with a tablet computer or a similar device, such as a touchscreen phone. It was also assumed that few educators would understand the implications of such devices for learning. In order to address such assumptions several measures were taken. At the beginning of the study I informally surveyed children on their familiarity with the tablet computer. During the first weeks of research, in which I immersed myself within the study site, I asked casual questions during downtime, outdoor playtime, or lunchtime:

1. Do you or someone you know have a tablet?
2. Do you or someone you know have a smartphone?
3. What sorts of things can you do with a tablet or smartphone?
4. Have you used a tablet or smartphone in the classroom? In what ways?

Children responded well to my casual probing and a majority expressed that their family had a tablet computer and a touchscreen phone. While some children noted that they were not allowed to "play" with their parents' phone, they were allowed to "play" with the tablet. When I asked children what they used the tablet for the most common responses were to play games or watch videos. When I asked children if they used such devices in the classroom they said that sometimes they got to use their teacher's tablet to play games.

In order to address assumptions regarding parents I distributed a short survey (see Appendix E) to measure how they and their children used tablets and touch screen phones. This data revealed that only six households, of the 35 surveyed, did not own a tablet computer. I also learned that 33 of those households encouraged use of tablets among children, if not at home, in other settings such as the classroom. This affirmed my assumption that a majority of the parents surveyed, and the participating children, were able to access these technologies and were familiar with the tablet interface. Educators were also surveyed (see Appendix F) regarding their experience working with tablets and touchscreen phones, and how they incorporate them into the classroom setting. I learned that all four educators surveyed had access to a tablet provided by the center, while only two owned their own personal devices. Only one of the four educators expressed a sincere enthusiasm for the tablet as an educational tool, while the remaining three maintained reservations, whether those were related to inexperience with the tool or apprehension towards introducing the tool to young children. With this, I confirmed my final assumption true, that a majority of the educators involved in the study did not hold a lot of prior knowledge regarding the tablet as an academic tool.

Limitations

There are several limitations associated with this line of research. As the collector and analyst of qualitative data I had a major responsibility to maintain accurate and trustworthy records of interpretation. Considering that this study spanned 15 weeks and accessed a fairly small number of participants it was feasible for one researcher to complete data collection and analysis. A similar study conducted with a team of researchers would produce more data from a larger sample of children, making

triangulation especially rich. A second limitation to the investigation was its minimal scope in regards to media studied. While I compared children's usage of the tablet as a drawing tool to their use of crayons on drawing paper I did not consider drawings made with markers, colored pencils, pastels, paint, or other tools used for artistic exploration. A final limitation to the study was the participating population. The Child Development Center is located on a mid-sized Midwestern university campus. As part of a university community it serves a variety of purposes. While serving as a preschool setting for students, faculty, staff, and the neighboring community the center is also regularly accessed as a site for student teachers to practice their craft and for researchers to explore lines of inquiry. The children and educators in the Child Development Center are quite accustomed to new faces and new experiences. The center is also relatively small both in physical size and the number of children it serves. As a result, it may be hard to generalize the results from this study to other populations. It may be equally difficult to replicate this study and its findings among different types of educational institutions.

Chapter Summary

The purpose of chapter one was to summarize my line of inquiry. Measures were taken to define the problem explored, my purpose statement, and accompanying research questions. The theoretical framework and information pertinent to understanding the background and context of this exploration were presented. Operational definitions were addressed and a study overview was included. Finally, assumptions and limitations were discussed. In the following chapter, I explore the literature pertinent to my line of inquiry.

Chapter Two: Literature Review

Prior to embarking upon formal research it is critical to consider all perspectives circling one's line of inquiry. In an effort to accomplish this I have considered pertinent literature within various domains. I begin by providing a working definition of terms, namely digital native and digital immigrant, which is important when considering the perceived role of technology in learning and culture at large. Since this particular study is interested in how technology and, specifically, tablet technologies can impact learning in an academic setting I continue by discussing how various levels of academia have explored tablets as tools for learning.

As I believe that other elements influence learning and development at large, I continue this review of the literature by looking at the cognitive, personal, and moral development of young children. I focus on early childhood, as this is the age range for this particular study. I consider how young children learn and what motivates them to learn individually and collaboratively. I also look at adults and the role they play in this development. Socialization and its implications serve as a transition into my discussion regarding adult and peer influences on artistic development. Following this, in an effort to build upon prior descriptions in chapter one, I continue by discussing the field of aesthetics and the topics of creativity and imagination in order to further illustrate my working understanding of how children develop artistically. This is followed by my final section of review, which details published studies concerning tablet computers and artistic development.

Today's Children: Technology Aficionados?

When it comes to the coinage of modern technology verbiage no one is more debated than author Marc Prensky (2010). He provides a challenging picture of today's youth, often times called digital natives. He writes that today's children are "deeply and permanently technologically enhanced, connected to their peers and the world in ways no generation has ever been before" (Prensky, 2010, p. 2). Digital natives, according to Prensky (2009), are those born into a technologically rich society and are "fluent in the digital language of computers, video games, and the Internet" (p. 306). Don Tapscott (1998) refers to this booming digital population as the Net Generation. He notes that "because N-Gen children are born with technology, they assimilate it…kids view technology as just another part of their environment, and they soak it up along with everything else" (p. 30). He goes so far as stating that, "for many kids, using the new technology is as natural as breathing" (p. 40). Tapscott summarizes today's net generation as independent, fast moving thinkers who are involved and engaged in the world around them.

Yet some have begun to dispute the use of terms like digital native (Rivoltella, 2012). Susan J. Bennett and Karl A. Maton (2010) point out that there is insufficient evidence concerning the existence of "an entire generation of digital natives" (p. 325). Others write that terms such as digital native "homogenize diverse and varied groups of individuals, using generational categorization to over-determine student characteristics" (Bayne & Ross, 2007, para. 4). These sentiments encourage that we question and reconsider such titles.

In a study designed to answer such a call Anousch Margaryan and Allison Littlejohn (2008) sought to find truth behind the terms Prensky advertises and others vehemently doubt. They surveyed 160 undergraduate students in Social Work and Engineering from two British universities. They also interviewed eight students in-depth as well as a mixture of eight lecturers and support staff from both institutions. Through their efforts, primarily quantitative in nature, Margaryan and Littlejohn found some evidence that younger pupils used tools more actively than their older colleagues, however, neither group used technologies effectively to support learning and growth. The authors suggest that we should not assume that all young students are digital natives, nor should we suppose that young students understand how to use technologies to support their own learning and development. As such, we should not assume those coined digital immigrants experience increased difficulty or stress when using technologies for personal or academic purposes. Yet, according to Prensky (2001) the difference between natives and immigrants is striking:

> As Digital Immigrants learn – like all immigrants, some better than others – to adapt to their environment, they always retain, to some degree, their "accent," that is, their foot in the past. The “digital immigrant accent” can be seen in such things as turning to the Internet for information second rather than first, or in reading the manual for a program rather than assuming that the program itself will teach us to use it. Today’s older folk were "socialized" differently from their kids, and are now in the process of learning a new language. And a language learned later in life, scientists tell us, goes into a different part of the brain. (p. 2)

While such a theory is interesting it still overly generalizes groups of individuals as Margaryan, Littlejohn (2008) and others suggest.

Those that believe in the existence of the native and the immigrant also believe that with time their defined differences will become less apparent due in part to enhanced digital wisdom. Prensky (2009) refers to digital wisdom as a specialized knowledge circling modern technologies. Prensky alludes that through technology we can become wiser and "access cognitive power beyond our innate capacity" (p. 1). But what is wisdom and what defines someone as being digitally wise? Many define wisdom as simply being able to determine the most appropriate solutions to real world problems. Yet there is much more to wisdom than solving problems. Robert Sternberg (2002) looks closely at the concept of wisdom and how to acquire it. Sternberg writes that, "teaching for wisdom means helping students to know what they know but also to know what they do not know, and even, at a given time, cannot know" (p. B20). He goes on to say that, "wise scholars realize that learning is lifelong, that there is no end in sight to what they can learn to broaden and deepen their work" (p. B20). This implies that wisdom involves the act of solving problems in real time, yet also maintaining an awareness and appreciation for the unknown. Prensky (2012) argues that wisdom and technology have been linked from the beginning. He quotes that "wise cave people, for example, used charcoal and paint to leave markings on trees or cave walls" (p. 46). While such cave people may have used current technology, in this case charcoal, to solve day-to-day problems, did they uphold the tool itself as the catalyst for their enhanced communication skills? Did they maintain an awareness and appreciation for unknown knowledge and,

furthermore, consider charcoal a tool that could push them intellectually? I find this debatable.

Perhaps a bi-product of this quest for digital wisdom is brain gain. Prensky (2012) defines brain gain and attributes it to "expanding human capabilities to the advance of technology" (p. 9). For Prensky technology is the reason why "human minds are being augmented, expanded, amplified, and enhanced at a furious pace" (p. 9). A related term to brain gain is digital literacy which, for advocates of technology, is necessary in the information society we currently live in. According to Michael Eraut (1991) the information society:

> Implies an awareness that there is a process of intellectualization in modern societies which requires increasing numbers of persons to possess a stock of knowledge enabling them to make creative use of the enormous potential of information. (p. 4)

This, according to Eraut, is "made possible by computing being introduced into all walks of life and by the media playing an ever greater role in the social and cultural environment" (p. 4). Patrick B. O'Sullivan (2000) would call this a technological determinist view, which "sees technology as almost an independent, willful entity that imposes itself on human social dynamics" and "will determine the ways in which it will affect society" (p. 54). While such sentiments appeal to Prensky's notions of digital wisdom and brain gain, O'Sullivan also speaks of those on the other side of the technological spectrum, those falling into the social determinist category. O'Sullivan argues that "rather than the technology driving change, technologies are human creations for human uses" and that "understanding people's motivations and goals, rather than the

characteristics of a technology" (p. 55) will help us better understand the implications of technology uses.

Perhaps in an effort to disprove Prensky's notion of digital wisdom Gavriel Salomon, David N. Perkins and Tamar Globerson (1991) ask the question, "can machines make people more intelligent" (p. 2). Salomon et al. believe that the "effects of technology can occur when partnership with a technology leaves a cognitive residue, equipping people with thinking skills and strategies that reorganize and enhance their performances" (p. 8). Salomon et al. believe that "such benefits are not likely to occur automatically as technologies advance" but "within the constraints of possibility and practicality" (p. 8). With this, "the effects of technology are what we choose to make them, and the responsibility of decision comes with the opportunity of choice" (p. 8). Similarly, Mark Warschauer (1999) combats the technological determinist view that digital tools are all-powerful. Warschauer references the invention of the printing press as an example. While a critical invention in time, he credits "the industrial revolution, not the industry of printing" to bringing about "mass print literacy" (p. 3). With this in mind, I think about Facebook®, YouTube®, a website, a touchscreen phone, a tablet computer, and their potential for making significant cultural change. All of these are particular online spaces or singular objects, which provide "a high-speed system for delivering responses and rewards" while also "presenting us with far more distractions than our ancestors ever had to contend with" (Carr, 2010, p. 10). Nicholas Carr (2008, 2010) writes extensively of the benefits and limitations of online and digital tools with a guarded stance. Carr (2010) believes that while such tools may enhance lower level abilities like multitasking, they also "hamper our ability to think deeply and creatively"

(p. 13). Considering such perspectives, I believe that cultural transformation may indeed involve technology and technological advances, but it will not be a product of one particular tool like the tablet computer. Instead, cultural change, specifically in regard to technology, will occur as a response to changed perceptions, changed opinions, and changed beliefs regarding successful ways to become wiser or perhaps more literate. With this perspective in mind, I believe it will be our evolving information society and changing perceptions of how knowledge is reached that will promote cultural change, not technology itself.

But, what is meant by culture, and furthermore, cultural change? June King McFee (1970) defines culture as "the pattern of living among a given group of people" which is accumulated through "shared values, beliefs, and opinions on acceptable behavior" (p. 26). Culture is comprised of "education, religion, science, art, folklore, and social organization" (p. 26). The term culture can be used to "describe a very large society" or "small, somewhat isolated or homogenous groups where the similarities among the people are more evident" (pp. 27-28). Over time cultures grow and change. McFee looks to perception-delineation theory as a means of describing how individuals grow, and how societies evolve "with distinct culture patterns" (p. 250). Perception-delineation "explains the tendency for new information to be structured in terms of learning that has already occurred" and "how prior learning" may influence "how new information will be seen or understood" (Efland, 1967, p. 73). Perception and conception are tools in this process (McFee, 1970, p. 252-253). Perception involves the processes of "identifying, sorting" and "organizing visual information and remembered images" (p. 253). Conception is "derived from experience" and involves "identifying, sorting" and

"organizing verbal and mental language labels for things" (pp. 252-253). Combined, perception and conception provide a basis for intellectual growth in which one's "ability to experience, to think about what he experiences with language and mental images and then symbolize these to communicate to others" (p. 252) matures and evolves. Jerome Bruner (1996) notes that,

> Cultures have always been in the process of change, and the rate of change becomes greater as our fates become increasingly intermingled through migrations, trade, and the rapid exchange of information. (p. 97)

While those like Prensky would merit technology for such a rapid exchange of information, Bruner seems to imply that cultural change involves much more than the tools we access.

I define cultural change as a response to changes in perception, which impact cultural beliefs and values. As individuals encounter new sensory information, new concepts, new experiences, and new technologies, their interpretations of the surrounding world and the behavior of others are modified. Kerry Freedman (1995) makes an interesting point when she notes that, "cultural change is not one-directional. Some aspects may be subject to change, others not" and some "may refuse to change…but be flexible in others" (p. 175). While the means to which we reach out to other parts of the world may continue along a techno-driven timeline the purpose remains the same. The purpose is communication, which fills a need for connecting with various members of one's own culture and those beyond in various ways. Such a perspective may be applied to the rise in social media. While I personally may prefer contacting friends and family through Facebook® my mother prefers a hand written note or a phone call. Through

either device we are communicating and making wanted connections with others. In my opinion, the difference between the two of us stems more from preference and experience rather than outright refusal, as Freedman (1995) implies. Some may interpret the technology, that being social media, as a catalyst for cultural change. Instead, I interpret our different levels of familiarity with technology to simply demonstrate variant manners in which we identify with individuals within our culture. My mother's perception of culture is slightly different than mine, because of her varied experiences with technology. Our values and beliefs have not changed, however. We still value family and friendship, and believe in maintaining ties with those we are close with. In this example cultural change has not occurred. In my opinion, cultural change must involve not only changes in perception, but also changes in values and beliefs.

With this, I am reminded of the broader discussion of digital native versus digital immigrant. Within the context of culture, and moreover, cultural change, some begin stipulating between those who seemingly embrace change and those who run away from it. By creating such categories it can be implied that natives and immigrants represent two extremes of a technological divide. I would agree that it may be true, those born into today's technologically rich world may have a different perception of culture than those who have experienced life prior to tablet computers and smartphones, but until those perceptions impact entire value and belief systems cultural change will not occur. If both parties are part of the same culture who share the same values and beliefs, perhaps just different perceptions, why then the need for labels and, furthermore, why the distinction of digital wisdom?

One segment of culture almost entirely responsible for formally acquired wisdom is the field of academia. While others debate that there are other ways to obtain wisdom besides formal schooling, the field of academia seems to be a good place to start if one is considering the existence of digital wisdom, as this research does. With the evolution of the information society and the continuous need for digital literacy it will become increasingly critical that today's teachers expose children to appropriate uses of technological tools. Yet, I do not suspect the tools themselves will transform education at large. Instead, such technologies will present differentiated ways of exploring and investigating new information as they represent mere strategies for navigating today's information society. In the following section I discuss how various levels of academia have considered technology, specifically, tablet technologies as potential tools for enhancing wisdom.

Cultural Change, Education, and Technology

In the previous pages I discussed the controversial terms digital native, digital immigrant, and digital wisdom in conjunction with perceptions regarding culture and cultural change. As a teacher, such underpinning philosophies have impacted my thinking regarding education at large. As McFee (1970) notes, education is a segment of culture, and thus, a potential site for cultural change. Could technology play a role in such change? More specifically, could tablet computers play a role in such change? In the previous pages I implied my belief that cultural change, or even changes to today's classroom, will not result from a specific tool. Instead, it will be changed beliefs and interpretations regarding learning that transform our actions. Whether technology plays any certain role in how we learn is the question.

Bruner (1996) notes that "school is a culture itself" which provides a "toolkit of techniques and procedures for understanding and managing your world" (p. 98). Education and culture are constantly intertwined, as it is impossible to learn or teach within an impenetrable bubble. Culture is a part of education and education is a part of culture. Jane Roland Martin (2011) seems to agree with this relationship between education and culture, as it is cultural stock that provides the need for education, in addition to the tools and media to learn in dynamic ways (p. 10). Martin uses this term, cultural stock, "rather than 'cultural capital' even though the latter has entered the lexicon, because 'capital' prejudges the vitally important question of whether the stuff of culture is valuable and 'stock' does not" (p. 10). Martin believes that education plays an important role in a type of metamorphosis involving a "process of change in which the capacities of an individual and the stock of a culture become yoked together" (p. 14). She attributes such metamorphoses to a series of educational encounters. Martin provides several examples of what an encounter is. I provide my own example, bringing the conversation back to tablet technologies.

Imagine you have a tablet computer sitting on the coffee table in your living room and your six-year-old niece comes for a visit. She sees the tablet, turns it on, moves the icons around a bit, and then moves on to something else in the room. This would be an example of encounter. She encountered the device, but did not exhibit much interest in its educational powers. Now, imagine that your eleven-year-old nephew comes into the room shortly after. He picks up the tablet and immediately opens an application for the local art museum. He sees a painting that interests him. He then goes to another application that features art history information. He reads about that particular artist and

their painterly style. He then opens a basic paint application and creates his own unique composition using the style he just learned about. The experience of the eleven-year-old is what I interpret as educational encounter, which is more powerful and long lasting. Now, surely both children had different intellectual capacities and different perspectives of culture and learning, yet the boy was able to successfully yoke intellect and perspective together to create a powerful and meaningful learning experience. This is not to say that one particular encounter, combining one's capacities and cultural stock, can be life altering or promote broader cultural change. Education's role, in my mind, is to present and encourage a variety of encounters over a period of time to provide powerful and meaningful learning opportunities that help students come to their own perceptions of culture. With time and vast experiences, yes, I believe cultural change may occur, and that education can facilitate such change. Change can occur at a micro-level, in which one classroom of students may take on varied perceptions of learning which, in turn, drastically change how and what they may learn. It can also occur at a broader level, impacting education at large. It remains difficult, however, to pinpoint when and how cultural change may occur in education, as it is associated with changed values and beliefs, which can be highly contentious and debated.

In contemporary literature technology is often the first to be merited when signs of potential cultural change are documented in education. Some publications to date describe today's classrooms as completely divergent from what they looked like years ago (Prensky, 2010; Tapscott, 1998). These classrooms are presumably filled with technologically savvy students representing a new population of learners who absorb and respond to new information in ways their teachers find hard to understand. Such authors

believe that because of such a technologically savvy population we must drastically change how we teach and communicate. Digital literacy is advertised as a staple skill-set for today's society and many interpret the tools associated with this literacy as cultural change agents. J. Michael Spector (2007), who writes of technology's past and current role in education at large, notes that today's generation has "shifted from learning from computers to one better characterized as learning with technology" (p. 251). This generation is known as the transformative era "because emphasis is being placed on the ways in which technology changes and transforms what people do" (p. 251). Considering the goals of this current era we are seeing increased literature regarding instructional technologies and how they can be used in the classroom in transformative ways. I provide a perspective, which attributes today's information society to changes in education and culture at large, not tablet computers and other similarly popular devices. This research hopes to backup such a claim.

Tablets and education.

The field of higher education, in particular, offers countless explorations regarding technology and, more specifically, tablet technologies and their influence on learning. I summarize several cases below beginning with instances of positive impacts on learning.

In a 2010 study Amelito G. Enriquez introduced convertible tablets during two comprehensive case studies. Convertible tablets are laptop computers which the user can swivel and adjust the screen to resemble a tablet like the iPad®. For one case study Enriquez compared two classroom settings, both looking at the same content and material from the same institution. One class was asked to utilize the convertible tablets and the

other went about a traditional means of lecture-based teaching without the technology. For the second case study Enriquez compared one class, which utilized the tablets, with a class of students from an entirely different university utilizing lecture methodologies. Enriquez (2010) confirmed statistically significant differences between the grades of those students participating in the convertible tablet groups and those who did not, implying that the use of convertible tablets enhanced student retention of core concepts. Overall students experienced greater opportunity to request academic assistance from the professor, enhanced note-taking abilities, as well as heightened organizational tools for course materials. This led to increased submission rates for assignments, better attendance rates, and more time spent outside of the classroom environment on expected course tasks.

Similarly, Ruth Anderson (2006) explored the "role student devices can play towards creating new communication channels between student and instructor" (p. 1). Using a program called Student Submissions and tablet computers Anderson accessed 71 classroom sessions from 18 university level courses. The study spanned the timeframe of one quarter involving 239 activities and over 4000 student artifacts. Anderson documented results for her study through "student surveys, classroom observations, instructor feedback, analysis of student artifacts, and detailed logs" (p. 2). While distraction was a common concern among students and instructors when utilizing the tablets and accompanying software, Anderson found that "students felt the system had a positive effect on their learning experience and that they were more engaged in lectures where the system was used" (p. 6). Anderson reported that 93% of students felt the tablet

had a positive impact on learning. Students found use of the technology engaging and enjoyable, and as a result, were presumed to be more actively learning.

Researchers Claudio Alvarez, Christian Brown, and Miguel Nussman (2011) completed a study in which they quantitatively looked at how netbooks and tablet computers could foster collaborative learning. Accessing a sample size of 20 Chilean college students, the researchers introduced two types of tablet computers and a personal digital assistant, or PDA, for exploration. Through observations, group assignments, and surveys, Alvarez et al. concluded that compared to traditional laptop computers mobile devices allowed for more fluidity and collaboration in the classroom setting.

John Fons (2010) writes of some of the ways he and a colleague integrated 60 tablet computers in discussion and laboratory sections of their chemistry and physics departments. Fons took a paperless approach to the classroom environment, dispersing lab procedures, course notes, homework assignments, and exams via tablet technologies. Fons described the various benefits of using tablets, which included ease in information distribution, increased participation during in-class time, and greater efficiency in providing feedback. In order to further quantify such benefits Fons distributed a survey to 44 students to gauge comfort level. Fons found that 91% of respondents felt that having course material on the tablet computer was beneficial, 78% preferred using the tablets over traditional pen and paper, 73% wished that all their classes utilized tablets, and 84% found the tablet helpful with course material overall.

Yet, not all higher education studies merit such positive results regarding the tablet computer. In a recent 2014 study, which surveyed 987 individuals from Sam Houston State University, researchers found that nearly half of respondents owned and

used tablets or similar devices (Cassidy, Colmenares, Jones, Manolovitz, Shen & Vieira, 2014). Surprisingly, despite such a large number of owners only five participants relayed that the tablet served all of their computing needs, implying that the device could not completely replace traditional desktop or laptop computers.

Another study drew similar results. Jim Hahn and Hilary Bussell (2012) invited first-year undergraduate students at the University of Illinois to check out a tablet for one week. A total of 24 students participated initially and 19 contributed to either an online survey or focus group discussion. While the tablet was praised for its wireless capabilities, mobility, convenience, and it led to enhanced productivity among participants, there were also drawbacks. Students reported that the device did not work for all facets of learning, including extensive research and writing assignments.

A 2013 study, conducted among two graduate level Earth Science courses, provided additional thought-provoking results (Wallace & Witus, 2013). While researchers found that use of tablet computers possibly increased productivity, efficiency, and general confidence in technology, pre- and post-test data implied that there was not a direct link between enhanced content knowledge and use of the device, as compared to traditional methods of teaching. The researchers also reported several pitfalls associated with using tablets. This included the financial commitment of supplying the tablets, significant set-up, and regular trouble-shooting.

Literature concerning the use of tablet technologies in higher education continues to spark rich conversation regarding the benefits and pitfalls of such tools in the classroom. At the same time, documentation regarding implementation at the secondary level remains sparse. While numerous periodicals emerge when searching on several

academic search engines for high school investigations of tablet technologies, many remain strictly informational and anecdotal, lacking quantitative or qualitative measures to solidify tangible academic results. Case in point, the writings of Casey Barton and Kenneth Collura (2003), who highlight the use of tablet computers at a Midwestern private high school. Many articles featuring the use of tablets in a high school setting mimic such an approach, highlighting ways in which tablets provide opportunities for growth, collaboration, and communication. While such publications are inspiring and crucial in the effort to further spread the positive interactions tablets can have on children they are lacking in quantitative or qualitative data.

One study that may serve as inspiration for future explorations in tablet technologies at the secondary level involved a one-to-one laptop initiative at the Denver School of Science and Technology (Zucker & Hug, 2007). The school's 11th and 12th grades and nearly every teacher received tablet computers, about 500 devices in total. The researchers took quantitative and qualitative measures to collect data, which involved teacher and student surveys, student, teacher, and administrator interviews, focus group discussions, classroom visits, and artifact collection. During the initiative some uses of the devices were mandated by way of the study, however, for the most part department chairs, teachers, and students were allotted the decisions of how, when, and where devices were used. Such use varied among subject areas and included access or creation of presentations, word processing, calculators and probes, simulations, electronic textbooks, Internet exploration, email, organization of digital resources, and daily assignment drills. Student responses indicated that most felt the devices had a "very (65%) or somewhat (29%) positive impact" (p. iii) on how they learned. Students

reported that the laptops increased their interest in school, affected their grades in a positive way, and encouraged collaboration with others. Similarly, teachers confirmed that the program was "very (67%) or somewhat (30%) important for students" (p. iii). Additionally, "a large majority of teachers reported an increase (57%) or slight increase (30%) in the depth of students' understanding of the curriculum as a result" (p. iii). While the researchers provide a thorough and extensive report of the study and its findings, they are also realists. They note that "a study of one school at a single point in time does not allow policymakers to draw scientifically rigorous causal conclusions" and that despite the sentiments of those participating, such a study "does not prove that the program raises test scores or helps students learn more" (p. 27). This being the case, the academic environment would strongly benefit from additional explorations of this kind within the high school environment.

Unlike the secondary domain, the preschool through eighth grade populations have taken an enthusiastic approach to researching ways in which tablet computers can enhance growth. This includes Sandy Li and Jacky Wai-cheong Pow's (2011) investigations of a primary school in Hong Kong in which children were enrolled in either a tablet computer scheme curriculum or a non-tablet scheme. Li and Pow followed two classrooms from each scheme, and collected data through daily student logs documenting learning experiences from five consecutive weeks. Through use of a non-parametric method to compare data from both groups of children the researchers confirmed that there was a significant difference among those working with tablets. Those who used the tablets spent significantly more time searching for and organizing information, while also taking part in partner tutoring opportunities. These observations

imply that the tablet classrooms experienced enhanced critical thinking, a strengthening of cognitive skills, as well as social learning opportunities.

Another research team, Robert M. Maninger and Mary Elizabeth Holden (2009), took a holistic approach while looking at a private southwestern k-8 school, collecting both quantitative and qualitative data for a one-to-one initiative with tablet computers. Maninger and Holden studied 106 children and 15 educators, and data was collected through classroom observations, teacher surveys, and teacher interviews. While Maninger and Holden noted that the data collected could not adequately address changes in student achievement they were able to identify some notable themes regarding classroom interactions with the technology. From classroom observations the researchers confirmed that children utilized the tablet computers often during small group work and individual work time to take notes and make use of various other software applications. From teacher surveys the researchers confirmed that children "showed improved engagement, interest, and involvement in both independent and collaborative work, and reported improvements in student problem solving, self-efficacy, work value" (p. 18). From interviews the researchers confirmed that teachers responded positively to tablet technologies in part because of the excellent technical and instructional support afforded from administration. While the research efforts of Maninger and Holden may not have elicited information regarding the achievement gains of children based on tablet interventions it does provide fruitful data regarding the ways in which educators can utilize such devices in the classroom and the support systems that must be in line to assist them. Such preliminary measures are critical to thoroughly understand the basic needs of educators when it comes to initiatives that involve such technologies.

A particularly powerful report, which focuses on early childhood and elementary education and the introduction of educational technologies, is entitled *Fool's Gold: A Critical Look at Computers in Childhood*. Within this document Colleen Cordes and Edward Miller (2000) present a comprehensive discussion of technology use in the classroom within the framework of child development research. The editors consider the developmental risks associated with technology in childhood, the need for technological literacy in an ever-changing world, and several real-world considerations including computer costs, political issues, and equal opportunity among children. The editors suggest that children be prepared in the following three ways regarding educational technologies:

1. Knowing how to use or operate particular tools.
2. Understanding, at least in a rudimentary way, how they work.
3. Developing the capacity to think critically, for one's self, about the entire realm of designing, using and adapting technologies to serve personal, social, and ecological goals in ways that sustain life on earth. (p. 67)

Cordes and Miller note that schools rarely work up to the third step of integration. Perhaps in an effort to dispute this outlook on technology in education many pre-school and elementary educators now regularly publish anecdotal findings regarding tablets in the classroom environment.

For example, Rena Shifflet, Cheri Toledo and Cassandra Mattoon (2012) candidly share one educator's discoveries integrating four tablet computers in her preschool classroom. The educator saw tremendous cooperation among children while sharing the devices, in addition to enhanced digital citizenship. By citizenship the authors detail how

children could easily discern differences between tablet activities and more traditional hands-on approaches, and because of this, they craved time with both domains. Such work speaks to the positive light for which tablet technologies are perceived in the primary grades.

Such positivity is continued in the writings of William Arthur Parnell and Jackie Bartlett (2012) who detail the power of such devices as reflective tools for educators. Parnell and Bartlett suggest the use of a tablet or a smartphone as a means of regularly documenting student progress. By taking photographs, recording video and audio, and making regular digital notes Parnell and Bartlett are able to blog for their students, which culminate into final portfolios. This process of regularly collecting data, according to Parnell and Bartlett, "helps everyone understand the children's development and learning and how to promote it" (p. 51). These researchers, as well as many others, encourage a positive and proactive approach to investigating such technologies and their implications for learning.

Whether considering children's direct usage of such technologies on their own, or how they can be used as a teacher tool, the preschool and elementary communities are well on their way to establishing a rich collection of informative literature. As such, the academic community at large is seeing a rise in publications concerning tablet computers and their educational implications.

Young Children

As Cordes and Miller (2000) imply, technology has become an important element in children's education, particularly when it comes to the acquisition of 21st century skills. While I may dispute such philosophies presented by Prensky and the like regarding

technology and its influence upon learning, I do not debate the efforts of trained educators incorporating technology in meaningful ways. I also do not debate the importance of observing other pertinent and respected theories that further define how children learn and develop. In the following pages I continue my exploration of the literature with an overview of the young child. I begin with a working definition of learning theory as a means of framing my understanding of children's cognitive development. This working definition of learning theory is followed by a similar overview of motivation theory. I continue the discussion by looking at children's personal and moral development. By considering these documented understandings I am better able to interpret how young children respond to new technologies presented in an academic setting.

Cognitive development.

In order to understand young "children's needs, motivations and attitudes it is…important to understand how children develop" (McIntyre, 2002, p. 8). There is no one "single, accepted view on how children develop" but instead "a range of influential theories on child development and learning which underpin our society's current concept of childhood" (p. 8). Some theories "seek to understand children using an 'inside out' explanation" (p. 8). In this case, the child is his own individual and motivation and behavior are derived from factors "such as intelligence or personality" (p. 8). Other theories look at how social factors influence motivation and behavior. I summarize cognitive, social cognitive, and constructive learning theories which, combined, provide a working understanding of how young children learn and develop.

Cognitive theory, or information processing theory, focuses on how information is absorbed by the learner, stored, and then later retrieved from long-term memory (Svinicki, 2004, p. 238). When learning occurs sensory registers are stimulated, which serve as "temporary holding cells" (p. 238) for knowledge. If an individual focuses hard enough information can be moved into working memory and then possibly processed for long term storage. While in working memory new information can be matched with previously learned material and stored accordingly. If the information is completely new, a new category must be made. Working memory is limited by time and space, so in order for new information to be placed in long-term memory it must remain fresh and not overcrowded by other new information. In order to retrieve information from long-term memory cues may be used to stimulate "the new information directly" (p. 238) or stimulate another piece of information in relation. Long-term memory is interconnected and "the more connections that a learner has for a given bit of information, the more meaningful it is" (p. 239) and also easier it is to retrieve.

According to cognitive theory preschool aged children are not yet developmentally ready to encode or create long lasting memory. As such, "even if preschoolers have a memory trace…that does not mean they will retrieve, or access, the memory trace later" (Svinicki, 2004, p. 100). This struggle is overcome as children mature and become better able to retrieve cues. This is important to keep in mind when introducing young children to new technologies. Adults who may get frustrated in having to repetitively show children how to access a particular application or save a work of digital art must remember that children of this age require external memory cues, most commonly, verbal cues shared by a teacher or other adult.

Another area of learning theory pertinent to this research, and to the understanding of how young children process new information, involves constructivist approaches. “Constructivist methods put the learner at the center of the process and in the driver’s seat” where learning is “based on student discovery and active interaction with the environment and among students” (Svinicki, 2004, p. 243). Jean Piaget (1936), who has contributed much to the understandings of children and how they develop, presents a philosophy often described as constructivist. His work is thought of in this way because of his “assumption that children construct their own body of knowledge from their experiences” (Ormrod, 1995, p. 35). This theory of development involves schemas, which are regularly modified through assimilation and accommodation (p. 36). Since my research involves three to five-year-old children, Piaget’s (1936) preoperational stage of development is of particular interest. This stage begins around the age of two years old and reaches to about six or seven. The key characteristic of this stage is the development of symbolic function. This is the “ability to use one thing to represent something else,” or in other words, “to use one thing as a symbol to stand for some other thing, which is then symbolized” (Harwood, Miller and Vasta, 2008, p. 241). Additionally, “language skills virtually explode” and “rapidly increasing vocabulary provide labels for newly developed schemas and serve as symbols that enable children to think about objects and events” (Ormord, 1995, pp. 40-41) even when they are not in sight. Some of the challenges of the preoperational phase include egocentrism, centration, or the ability to focus on one element of a situation at a time, as well as conservation. These insights are critical to consider when introducing young children to technologies for several reasons. One, as egocentric individuals, children may struggle when sharing devices, or fail to understand

why others may be invested in similar experiences. Two, children in this phase must focus on one experience at a time, and still, even with encouraged application, may exhibit incorrect judgments. Finally, children at this age express difficulty in differentiating between that which appears in front of them from reality. As such, they may misinterpret augmented digital experiences for real-world experiences.

A final learning theory, important to this line of research, is social cognitive theory. "Social cognitive theory asserts that there are other ways to learn and other forces that influence behavior" (Svinicki, 2004, p. 241) besides internal brain development. The child, according to this theory, learns through the observation of others. "When observing a model, the learner creates a mental representation of the behavior seen and then can use that mental model to later reproduce the behavior" (p. 241). Environment can play a role in this sequence as it can reinforce such a response, or do the opposite and punish the response. "This interaction between the learner's mental representations and interpretations, the overt behavior, and the environmental consequences determines future occurrences of the behavior" (p. 241). For the preschool aged child and older observational learning can take on one of two modes. "First, observational learning can take place through vicarious reinforcement" (Woolfolk, 1998, p. 226). Here the child sees "others being rewarded or punished for particular actions" (p. 226) and they then modify their own behavior accordingly. "In the second kind of observational learning, the observer imitates the behavior of a model even though the model receives no reinforcement or punishment" (p. 226). The preschool aged child learns observationally from peers and adults. They also learn through verbal and nonverbal feedback. This theory is important to keep at the forefront of one's mind when introducing young

children to technologies, as it is quite likely that children will learn how to interact and treat a particular technology simply by watching, listening, and mimicking the actions of their peers and the adults around them. The social implications of adults and peers in learning will be discussed again at length later on in this chapter.

Motivation.

In addition to theories discussed previously other dynamics can influence what a young child learns and does not learn. A contributing factor is motivation. Following I discuss intrinsic and extrinsic motivation and the role of novelty in learning. Such a discussion is significant to this research, as I hope to unravel the motivating factors which engage young children with technology. Several questions come to mind when considering technology and children's motivations to use such devices as learning tools. First, does the child place value upon the presented learning experience? Does prior knowledge or experiences influence whether or not a child is motivated to learn? Does the child see benefits to proceeding, or do they worry about known consequences? Is the child interested in simply experimenting, or is the goal to master a particular skill? Is a sense of control important to the learner, and if so, is the learner in control of the situation at hand? All of these questions can be categorized as either intrinsic or extrinsic concerns.

An intrinsically motivated child acts based on the enjoyment or challenge experienced. Such motivation resides in the individual and "not everyone is intrinsically motivated for any particular task" (Ryan & Deci, 2000, p. 56). On the other hand "extrinsic motivation is a construct that pertains whenever an activity is done in order to attain some separable outcome" (p. 60). Extrinsic motivation varies from intrinsic in "its instrumental value" (p. 60). Some extrinsic motivators work to "satisfy an external

demand" or to "obtain an externally imposed reward" (p. 61). Sometimes extrinsic motivations are a result of feelings "of pressure in order to avoid guilt or anxiety or to attain ego-enhancements or pride" (p. 62). Extrinsically motivated situations are those instances in which some external force is encouraging short-lived attention. Intrinsically motivated situations are those experiences pursued by the learner and characterized by sincere feelings of pleasure or satisfaction.

Perhaps one phenomenon, which often plays a role in the classroom setting, involves the issue of novelty. Novelty, within the scope of this discussion, can be defined as either an intrinsic motivator or an extrinsic motivator depending upon a participant's interpretation and response to a certain learning tool or experience. I discuss both interpretations in combination with relevant research.

Among his discussions of learning theory Steven W. Rose (2003) touches upon the concept of novelty. Rose writes that, "if a learning task is associated emotionally with feelings of success or novelty – power or fun…then the learner is apt to be motivated to pursue that task" (p. 54). If the "task is associated with a fear of failure or boredom, then the learner is unlikely to engage in it in any wholehearted way" (p. 54). Rose links the idea of novelty to intrinsic motivation, implying that an increased "sense of power and fun" (p. 54) elevates the potential for student success.

Others consider the concept of novelty fleeting and more extrinsic. Beverley Park (2006) warns that novelty should not be used as an "ongoing method of engaging learners" because "while we know that students respond to novelty, we also know that the brain is a pattern seeker" (p. 64). The process of learning involves "making and strengthening neuronal connections" in which learners "seek to hook any new

information to that which is already known" (p. 64). For Park meaningful and relevant content is what truly influences "student engagement in learning" (p. 64) rather than new and enticing methods or, per say, gadgets. Others make similar statements regarding the dangers of novelty. Jordan Poppenk, Stefan Köhler, and Morris Moscovitch (2010) write that, "representations of a novel item may be established during a first exposure and may contain little information other than a specification of the stimulus itself" (p. 326). Contextual information is crucial when processing meaningful and relevant information, and novelty does not always provide such context. Similarly, Joan H. Cantor and Gordon N. Cantor (1964) propose that while "it is conceivable that novel stimuli might elicit first fixations or choice responses because they provide an element of change or surprise" (p. 127) they may not provide sustainable interest or value.

Particularly interesting for this line of research is the work of David A. Bergin, Martin E. Ford and Robert D. Hess (1993) who studied novelty effect in combination with technology integration. Participants included 95 kindergarten aged students and four teachers in three schools. Four classrooms were studied in total, all of which were equipped with microcomputers. The researchers found the microcomputers used to be "highly motivating," however "there was evidence of a mild form of novelty effect" in which "across time, high levels of interest were maintained, but expressions of this motivational pattern became less overt" (p. 443). Perhaps this leveling out of enthusiasm could be attributed to the fact that the microcomputer had become a common and familiar tool. Such findings regarding novelty and technology are of particular interest for this study in my efforts to unravel whether or not the tablet computer serves as an intrinsic or extrinsic motivator.

Personal development.

In order to build upon my previously discussed understandings of learning and motivation, I probe the literature further. I consider young children and how they develop personally and morally. I begin this discussion with an introduction of Erik Erikson and his thoughts regarding personal development.

Like Piaget, and others discussed earlier in this document, Erikson (1968) interpreted development as a series of stages. Each stage is interdependent and involves a developmental crisis. "Each crisis involves a conflict" and "the way in which the individual resolves each crisis will have a lasting effect…on self image and view of society" (Woolfolk, 1998, p. 67). For Erikson (1968), the preschool years, and specifically those children between the ages of three and six years old are within a stage of independence. Called the initiative versus guilt stage, children at this age have begun to "trust the aspects of their world that are beyond their control" (Woolfolk, 1998, p. 67). They have begun "to assume important responsibilities for self-care like feeding, toileting and dressing" and they have finally come to "the realization that some activities are forbidden" (p. 68). A child at this stage of development also "continues to become more assertive and to take more initiative" (p. 67). At the same time, Erikson (1968) notes that "the great governor of initiative is conscience. The child…not only feels afraid of being found out, but he also hears the 'inner voice' of self-observation, self-guidance, and self-punishment" (p. 119). As such, Erikson warns that "from the point of view of human vitality…that if this great achievement is overburdened by all too eager adults, it can be bad for the spirit and for morality itself" (p. 119). Parents of such children "tread a fine line; they must be protective-but not overprotective" (Woolfolk, 1998, p. 68). Adults

must maintain "a reassuring, confident attitude" (p. 68) which encourages the child to explore doubt free.

The level of doubt a child may have regarding his or her ability to complete a certain task or activity is closely related to their self-concept or self-esteem. "Often used interchangeably" both concepts "have distinct meanings. Self-concept is a cognitive structure-a belief about who you are" whereas "self-esteem is an affective reaction-an evaluation of who you are" (Woolfolk, 1998, p. 73). Children "tend to have an overall, general feeling of self-worth: they believe either that they are good, capable individuals, or that they are somehow inept or unworthy" (Ormrod, 1995, p. 90). "They are usually aware that they have both strengths and weaknesses" and "they realize that they do some things better than other things" (p. 90). Children are constantly gathering their own data from peers and adults in order to self-evaluate and they often "gauge the verbal and nonverbal reactions of significant people…to make judgments" (Woolfolk, 1998, p. 75). In this way, social interaction can have a powerful impact upon how children consider themselves and their abilities. Howard Gardner (1973) speaks of a child's sense of self as a process of socialization and learning from others. He notes that, "the child's sense of his self grows by imitation of the other, while his sense of the other grows in terms of his sense of himself" (p. 94). While in the beginning a child may exhibit egocentric tendencies in which their world is primarily self-encompassing, this changes over time.

Moral development.

As a child builds interpersonal understandings and begins to see that different groups of people cater to different social rules they also begin to undergo stages of moral reasoning. Since moral reasoning involves human decision-making and ethical behaviors

it also impacts social interactions. After presenting young children through adults with moral dilemmas Lawrence Kohlberg (1981) confirmed that there are three levels of moral development. Preschool aged children, specifically, are at the preconventional level and experience undifferentiated perspective-taking. They "recognize that the self and others can have different thoughts and feelings," however they often "confuse the two" (Woolfolk, 1998, p. 81). Children are exposed to various moral dilemmas throughout their development and often these dilemmas are presented within a particular social convention such as a household or a classroom. "Social conventions are the social rules and expectations of a particular group or society" (Woolfolk, 1998, p. 83). Through such interactions children learn what is appropriate social response and what is not within a particular convention. A child who demonstrates appropriate responses is commonly coined prosocial. Prosocial behaviors "are the opposite of antisocial conduct, such as selfishness and aggression" (Kostelnik, Whiren, Soderman & Gregory, 2006, p. 425). "Children who engage in prosocial behavior" often "develop feelings of satisfaction and competence from assisting others" (p. 425). This can enhance notions of self-concept and self-esteem, which can impact future social encounters. Undoubtedly "the most important contributors" (Ormrod, 1995, p. 81) to a child's personal, moral, and social growth are other people, including teachers and fellow classmates. It is therefore necessary to focus on how adults and pupils can further influence children's development through social encounters. The following section is dedicated to the discussion of adults and peers, and the role they play in children's development.

Adults and Peers: The Role They Play in Children's Development

As indicated previously, it is through the process of socialization that children learn of a society's norms and also the roles different individuals play. "Parents are the first and probably most influential socialization agents" (Ormrod, 1995, p. 82). Yet, parents are not the only adult figures that can influence children's personal and moral development. Other adult family members play a role, as well as teachers, community members, and in this case, researchers.

The predominant way in which adults influence a positive environment and aid in children's decision-making processes is through feedback, both verbal and non-verbal (Stanulis & Manning, 2002). I define feedback as a motivational process, which can "influence a child's acquisition, transfer, and use of knowledge and skills" (Dweck, 1986, p. 1040). The most basic form of feedback an adult can provide is through word of mouth. Teachers specifically provide verbal feedback during formal learning activities in which they command the attention of students and informally while observing and directing students during individual and group work. Another way in which adults provide verbal feedback is through written communication. While such communication may not necessarily be shared by word of mouth I place such a measure in this category because of its association with words and language.

When an adult is not directly talking to or providing written feedback to children they are likely responding in other physical ways. Just as important as the words spoken in a classroom environment so too are those silent moments. "How much adults say, what they say, how they speak, to whom they talk, and how well they listen" (Kostelnik, Stein, & Whiren, 1988, p. 29) also play a role. Facial expression, posture, and bodily

placement additionally can communicate volumes to children (Stanulis & Manning, 2002). Children at the preschool level, particularly, experience an explosion of language skills and they are often eager to verbally share the experiences that they have encountered and the new concepts they have learned with the adults around them. Teachers who are aware of their facial expressions and posture when children are communicating with them can have an influence on future encounters. A teacher who is smiling and holds an open-armed stance is more likely to motivate active sharing among students. Similarly, how an adult moves about the space and reacts to children as they explore activities and materials on their own can motivate learning. Getting down to a child's level, smiling, and nodding can motivate further exploration of media and content. Furthermore, moving from child to child and group to group can communicate to children that all students are of equal worth and importance. This feeling of self-value can further motivate student success (Stanulis & Manning, 2002). Additionally, an adult who seems happy and engaged in educational experiences themselves can reinforce intrinsic motivation in children, as they demonstrate with their own actions a love for learning and teaching.

Other ways in which adults nonverbally communicate with children is through their design of experiences and space (Stanulis & Manning, 2002). For example, teachers can nonverbally communicate the importance of specific content or skillsets through the activities they design for students. They can also communicate the importance of particular tools based on which ones are present during certain activities. Similarly, teachers can nonverbally communicate student autonomy through the design of the classroom itself, and also the role they play as an authority figure. A teacher who creates

an atmosphere that allows children to explore safely and meaningfully, and who also allows a sense of choice and control among students in classroom decision-making can be highly motivating.

In addition to the adults in their life children's peers can influence their personal and moral development. Children's relationships with parents and teachers are usually unequal, as "adults have the upper hand and control the nature of interactions" (Ormrod, 1995, p. 87). With a peer, however, a child is with an "equal partner" (p. 87). Children communicate with one another in similar ways as adults, using verbal and nonverbal cues. Young children verbally share when they are happy or excited, and they are quick to report when they are upset or frustrated with a situation. Nonverbally they may smile, bounce around, or hug their young counterparts. They may also shut down, frown, and cross their arms in anger. Through these interactions it is fairly easy to identify prosocial or antisocial behaviors in children. As Lev Vygotsky (1998) implies, over time, peers can help children engage in prosocial behaviors through modeling and leading by example.

One field which is particularly responsible for documented instances of social influence, and which is equally critical to this line of inquiry, is the visual arts. Art educators and researchers alike have taken interest in the ways adults and peers can influence children's artistic development. Noted in chapter one, artistic development serves as a theoretical backbone for this research, while it also stands as another important phase in a child's overall learning and development. In fact, in many ways, the drawings of young children share evidence of how they are developing cognitively, socially, personally, and morally, in addition to the motivators that contribute to such

growth. I continue my discussion of artistic development here, first focusing on adult and peer influences.

Socialization and the impact on children's artistic development.

June King McFee and Rogena M. Degge (1977) assume that "creative behavior is a complex of abilities that most people have in some degree, depending upon both their unique potential and their opportunity for development" (p. 356). This is reminiscent of Vygotsky (1998) who wrote, "what the child can do today in cooperation and with guidance, tomorrow he will be able to do independently (p. 202). Vygotsky attributes social interaction to the development of complex skills sets and the diminishing of egocentric thought among young children. Diana Korzenik (1979) furthers this by attributing advanced drawing ability to social development. She writes "the form of young children's drawings is actually a result of their social maturity" detailing that "the unreadable drawings of young children, up through five or six years old, are found to be the by-product of egocentric thinking" (p. 28). "As egocentricity diminishes" and the child ages "we find the young child occupied with looking at his work as if he were the viewer and as if the viewer did not know his intentions." (p. 28). As such, "drawing behaviors reflect the increasing capacity of the child to consider the needs of 'the other'" (p. 28). In this way, drawing and other creative outlets can potentially provide visual evidence of how children are developing socially. Vygotsky (1971) adds that,

> Art is the social within us, and even if its action is performed by a single individual, it does not mean that its essence is individual. It is quite naïve and inappropriate to take the social to be collective, as with a large crowd of persons. (p. 249)

According to Vygotsky "art is the social technique of emotion, a tool of society which brings the most intimate and personal aspects of our being into the circle of social life" (p. 249). So with this notion in mind we must consider creativity and artistic experience not only as an avenue for social development, but also a product of social influences.

Anna Stetsenko (1995) writes that, "human life in its essential characteristics and from its very onset is fundamentally social…based on interactions between people, organized as interactions between people and developed through interactions between people" (p. 149). Similar to the philosophies of Feldman (1994), Stetsenko (1995) believes that, "the process of drawing should not be treated as isolated from other mental abilities" but instead considered to be one process "aimed at an overarching task of mastering social-semiotic ways of communicating" (p. 150). Arthur D. Efland (2002) discusses at great length Vygotskian notions and their implications for learning in the arts. He states that, "learning occurs in a social context, and knowledge and development are largely dependent on the social context in which these processes occur" (p. 36). Art making, and drawing specifically, can be a highly social experience particularly in a preschool setting, as children often observe the mark making of their teachers and their peers prior to creating their own artworks. Efland writes that, "when educational environments open zones of proximal development there is a mediation between the thought of two or more people, the shared perspectives of the teacher and pupil" (p. 36). In summary, young children develop personally and socially as well as creatively and artistically, and adults and peers can help scaffold this growth in children through collaboration and modeling.

Keeping these ideas regarding a child's need to communicate and the role artistic experience can play in social development in mind, I consider further how the interactions of adults can influence children's creativity and artistic experiences. I am reminded of the work of Jeanne Ellis Ormrod (1995) who suggests a "happy medium" (p. 83) when it comes to adult contact. For Ormrod, "children thrive when there is some control in their lives while at the same time their own individual rights and needs are recognized" (p. 83). This same philosophy can be applied to creativity and artistic experience. Adults who facilitate artistic experiences must be aware of how children develop cognitively, personally, and morally. From a social standpoint, adults must be aware that children learn through observation. They must be acutely aware of how they present new media and content, how they design different learning opportunities, and how they facilitate learning spaces. How adults interact with young children in these ways, both verbally and nonverbally, can impact children's creative growth. In order to encourage creativity among young children adults must allow a sense of control, as Ormrod suggests. Ursula Kolbe (1993) writes that the "interaction between a child and an interested, responsive and involved adult, is essential. The interaction may at times be extremely subtle, varying between silence, running commentary, or continuous conversation between the two" (p. 76). Kolbe suggests that when the facilitating adult becomes aware of the child's strengths and challenges meaningful intervention can take place. In other words, when an adult is aware of child's zone of proximal development, they can appropriately intervene during artistic experiences to scaffold learning of new concepts, media tools, or artistic processes. If adults wish to encourage creativity and exploration via artistic measures it is important that they regularly reflect upon the ways

they interact with young children, as these interactions can have major implications upon the ways children learn. Knowing that children learn from observation it is critical that adults remain aware of how they and other students treat materials and respond to creative prompts. Considering that children are regularly developing their sense of self it is critical that adults highlight their creative strengths and scaffold experiences based on their zone of proximal development. Knowing that children are developing a sense of moral reasoning it is critical that adults reinforce the idea that there is no right or wrong way to create. In these ways adults can ensure that they are having positive social interactions with young children.

At the same time, children can experience equally positive interactions with peers. Christine Thompson (1999) writes that, "early artistic development was traditionally characterized as a solitary process of exploration and emergence, a matter of natural growth unfolding, and perhaps thriving most successfully under circumstances of benign neglect" (p. 63). However, the reality is "solitary moments are rare in the lives of young children who spend their days in nursery schools and playgroups, preschool and kindergarten classrooms" (p. 63). Thompson believes that "neither development nor learning could occur without the mediation of others" (p. 64). Young children specifically "are just beginning the process of learning to use the tools and interpret the symbols through which the culture preserves and passes on its beliefs and aspirations, its questions and its certainties" (p. 64). Because young children lack "immediate access to many cultural forms of mediation" they "are quite dependent upon the direct assistance of other people" (p. 64). Thus, when peers are felt to be of equal worth, when both parties exhibit prosocial behaviors, and when one is slightly more capable it is natural for children to

learn from one another. Children watch how their peers interact with particular media, they observe the types of drawings they render, and also discuss each other's explorations. "Eventually, the knowledge, skills and behaviors children encounter through others are appropriated and internalized, subsumed into their own repertoires of thought and action" (p. 64). Chris J. Boyatzis and Gretchen Albertini (2000) put it well when they state that, "surely children often draw alone, but even then they may benefit from hearing the internalized questions, evaluations, and suggestions of peers echoing from actual dyadic or group interaction" (p. 46). As Thompson (1999) puts it, "when preschool and kindergarten children draw in close proximity to others, they initiate interactions" (p. 66) sometimes consciously and other times unconsciously.

While it is understood that children can positively influence one another, a reoccurring question for this researcher involves children who struggle socially and their ability to learn from others. In other words, do children who exhibit antisocial behaviors find observational learning challenging? While exploring such a possibility I discovered one researcher who found that observational learning could have a negative impact upon development. Jonathan R. Tudge (1992) reported study findings that indicated children's observations could have a regressive influence upon development (p. 1377). While Tudge's work did not directly relate to artistic measures such findings must be kept in mind when considering how children may influence peers' creative actions. Thompson (1999) writes that "occasionally children teach one another things we would rather they did not" (p. 66). Here, the role of the adult is critical, both to observe children's interactions with peers in real-time, and to redirect if necessary. Boyatzis and Albertini (2000) further suggest that researchers "study the co-construction of artwork to better

understand both artistic development and peer collaboration" while also assessing "children's drawing behavior with and without peer collaborators, and with peers of varying degrees of expertise" (p. 46). Such sentiments have undoubtedly influenced this particular research.

Art, Creativity, and Aesthetic Appreciation

In this section of review I take one small step back in order to fully conceptualize my working understanding of artistic development. In previous sections I identified researchers who have set a foundational understanding of artistic development, namely Lowenfeld, Brittain, Hurwitz, Day, and Kellogg. I have also noted the social implications involved in such a process. Here, I consider the visual arts broadly at first, and in relation to culture. I then look at other conversations critical to acquiring a strong understanding of artistic development, including the discussion of creativity and aesthetics. This section of review is followed by an analysis of the literature circling artistic development and tablet technologies. This serves as an important link, which connects my exploration of the literature with my study at hand.

I begin by conceptualizing the important act of drawing as a process in learning how to organize and understand one's culture. For Jerome Bruner (1996) the expression of culture "inheres in meaning making, assigning meanings to things in different settings on particular occasions" (p. 3). This involves "situating encounters with the world in their appropriate cultural contexts in order to know what they are about" (p. 3). Bruner emphasizes that by creating and utilizing a system of symbols we are better able to organize and understand our world. The development of such a symbolic system is supported and fostered through the arts and becomes increasingly sophisticated as one

develops artistically. As an artist, and as an art educator, I have developed a complex symbolic system inspired by the visual world that surrounds me. From as early on as I could see I began to observe and absorb complex visual images. Over time, exposure to culture has shaped how I apply meaning to such imagery. For McFee and Degge (1977) the artful experience of drawing is closely related to this act of seeing which, in turn, leads to symbolism (p. 12). They believe that:

> Although art starts with individuals, it takes forms that have meaning for many people. Thus art becomes a communication system. A people's values and beliefs are expressed through their art. The subject matter of art illustrates the status and roles of people, what is important to observe in nature, what critical ideas need to be considered. (p. 7)

McFee and Degge (1977) emphasize that seeing, and in-turn drawing, "is not limited to the usual viewing of things. It includes creative and inquisitive looking as well" (p. 12). This involves "seeing things from unusual views and distances, in uncommon lights, in new groupings, and in rare juxtapositions" (p. 12). According to McFee and Degge "people who see creatively look for the emotion-provoking qualities in things, the moods produced by the ways colors, shapes, and textures are used…aware of the sensory feelings one could get if one touched what one saw" (p. 12). It is this creative and inquisitive looking that leads to meaning making, which for me, represents the epitome of meaningful learning, or true educational encounter, as discussed in sections previously. This is perhaps the reason why I believe art education in today's society is so important, as art is the modality for which we interpret and perceive culture. This is also perhaps the reason why I have chosen art, and specifically drawing, as the avenue to uncover

children's perceptions of the tablet computer. Perhaps through the creation of digital drawings children will unconsciously interpret and perceive technology as a potential tool for learning and artistic exploration.

But what else can be inferred from creativity, besides creatively and inquisitively looking at the world, and interpreting it? Others like McFee and Degge discuss creativity, but less broadly, and in connection with young children's growth and development. For Elliot Eisner (1976) "creative thinking is supposed to emanate from the deeper levels of human mentation" (p. 7). As such, creativity can "be unlocked" (p. 7) through artistic exploration. Without the extra baggage of "conventional expectations and rules" associated with traditional curricula, the arts have the potential to reveal the "creative, imaginative life" (p. 7) of children. For Eisner the visual arts present opportunities for children to explore and practice complex skill-sets. The act of transforming traditional and now contemporary art media into imagery that embodies internalized feelings and ideas is an intriguing phenomenon, and one that emulates 21st century skills. When engaged in art making activities children begin to notice "subtleties among qualitative relationships," they conceive "imaginative possibilities," they interpret "metaphorical meaning," and they exploit "unanticipated opportunities in the course of" their work (Eisner, 2002, p. 35). Each of these processes "require complex cognitive modes of thought" (p. 35) and Eisner sees the art classroom as the perfect place to foster such risk taking and problem solving.

A closely related term to creativity is imagination. According to Eisner (2002) "the sensory world is a source of satisfaction, and imagination is a source of exploratory delight" (p. 5). Eisner defines imagination as "the form of thinking that engenders

images of the possible" which in turn "enables us to try new things out…without the consequences we might encounter if we had to act upon them empirically" (p. 5). Perhaps this is why Eisner emphasizes the need for play among children. Play, and art for that matter, "provides a safety net" (p. 5) for experimentation.

For many it is thought that a certain technical capacity is required in order for children to create. According to Eisner (1976), while the issue of technique is important to address when evaluating children's artwork, it is not paramount. Eisner believes that aesthetic and expressive awareness is present during all stages of development in some form or another. He notes that such "aesthetic satisfaction" (p. 10) differs from stage to stage, depending upon the cognitive development of the artist. Such satisfaction, it then seems, is achieved when a child feels successful in their use of technique, in solving a creative problem, or in communicating a particular message. To expand upon this, Howard Gardner (1973) writes that:

> The aesthetic involves an attempt to communicate. It is deliberate, intentional. The artist fashions something that would have an effect on someone else. Because the arts involve communication between subjects, human beings must be involved in the artistic process…a child's early efforts with a pencil or brush, or the drippings of an action painter may be aesthetic, as these activities typically involve a desire on the part of one subject to communicate. (pp. 30-31)

Yet the aesthetic does not always result in an art artifact. One can, in a sense, embody aesthetic thinking. E. Louis Lankford (1986) defines aesthetics as a process of "asking questions and searching for answers about the nature of art" (p. 49). It is also about "learning to accept… gray areas, living with alternative answers to single questions,

viewing…with a critical eye, and making decisions based upon fairness of reasons, and experience" (p. 49). Such an approach to aesthetic understanding was not unlike the methodologies used within this line of inquiry, not only in the analysis of children's digital drawings, but also when considering the perceived role of tablet computers in art making. Lankford (1990) suggests an issue-centered and investigative approach while exploring aesthetics, which includes active participation, questioning strategies, and analysis of ideas and applications, all while maintaining an open mind and a sense of tolerance and acceptance in various alternatives (p. 52). Within the scope of this research attempts were made to become a participant observer who questioned and analyzed the process of drawing digitally with a tablet, while also maintaining an open mind regarding external factors, unanswered questions, and diverse perceptions among key players.

Tablets and Artistic Development

Few studies exist which explore the combination of children's artistic development through use of tablet technologies. I discuss three cases in which researchers investigated tablets for artistic measures among children. I begin with the work of John Matthews and Peter Seow (2007), who conducted a small study in Singapore and looked closely at the digital interactions of 12 children, from two through eleven years old representing a variety of socioeconomic groups and experience levels regarding computer usage.

Matthews and Seow (2007) provided access to tablet technologies and encouraged child participants to draw whatever they liked within the timeframe of one full hour. In order to gather and code data video evidence was collected while observing children's use of tablet technologies and more traditional media in naturalistic settings. Matthews

and Seow (2007) organize their findings into a series of broad and overarching statements concerning children's perceptions of basic art fundamentals through use of the technology. Specific topics included color, tonal variation, line, and shape. When it came to the exploration of color, the researchers found "the notion that very young children are incapable of using more than one or two colours [spelling from original text]" to be "flatly contradicted when the children were offered an electronic palette" (p. 257). Even the youngest of participants were able to choose from a near limitless array of color. Regarding tonal variation, the researchers concluded that, "subjects had little or no such problems with adjusting tone and mixing hue and tone together" (p. 259). Concerning line and shape Matthews and Seow note that, "children were intrinsically motivated to explore line and shape very thoroughly" (p. 259) with the technology. For Matthews and Seow this final discovery, concerning children's explorations of line and shape, led to a deeper understanding regarding the connection between artistic measures and linguistic qualities, as often times Chinese characters and verbal associations would find their way into either the discussion of artworks or actual renderings.

A second pair of researchers who investigated children's artistic explorations via tablet technologies included Leslie J. Couse and Dora W. Chen (2010). They build upon the research endeavors of Matthews and Seow, who provide little in the way of a descriptive methodology. Couse and Chen's had two research questions:

1. Is stylus-interfaced technology a viable tool for early education?
2. How can stylus-interfaced technology align with technology curriculum standards for early education (p. 80).

Couse and Chen took a mixed-method, grounded theory approach in their study of 41 children from three to six years old, and they accessed a university early childhood center in the northeastern area of the United States. The researchers began their investigation with a parent survey in order to gain demographic information and solicit insights regarding children's present experiences with technology. Children were then invited to work in pairs in a room equipped with tablet technologies. The researchers collected data during four phases. These included an "introductory and subsequent warm-up sessions…a final self-portrait drawing session…and two separate interviews" (p. 83). The researchers were able to come to several conclusions at the end of their efforts. They found that by phase two of their research all but "one child (2%) was still operating at the Investigation level" (p. 89). The remainder of their sample was extremely comfortable utilizing tablets. The researchers also found a significant difference in the amount of time spent with the tablets. "Three-year-olds spent significantly less time (M=13 minutes) than four and five-year-olds (M= 23.64 minutes and 23.79 minutes, respectively)" (p. 89). In addition, the researchers discovered that 25 out of 39 interview responses indicated that children "preferred to use the tablet rather than traditional writing materials" (p. 90). The researchers go on to mention that 13 preferred traditional media and one noted no preference. Finally, after interviewing teachers, the researchers were able to qualify the novelty of tablets among children. Based on teacher feedback, the researchers maintain that interest level in utilizing tablet technologies among children remained extremely high. Such a mixed-methods approach by Couse and Chen provide meaningful and timely research regarding evolving technology and artistic measures among youth, and build upon a growing interest regarding how tablet technologies can enhance childhood

experiences. Additionally, their detailed methodology served as a valuable model for this investigation.

Finally, in a 2014 study, Delphine Picard, Perrine Martin, and Raphaele Tsao set off to examine the iPad's® implications for drawing in an educational setting. The researchers worked with 46 children ranging between five and eight years old. Several classrooms were accessed for research in which a drawing workshop was set up in a corner of each room. This drawing workshop provided access to an iPad® tablet, white paper, and a black felt tip pen. Children visited the workshop area independently and were asked to make their best drawing of a house with both media choices. Children were given up to ten minutes to create their drawings, and 92 paper and digital drawings were collected and analyzed. The researchers' findings were significant. They found that children's digital drawings were far less detailed than their traditional versions, and they attribute such findings to "fundamental differences between drawing with a pen on a page and drawing with a fingertip on a flat screen" (Picard, Martin & Tsao, 2014, p. 210). The researchers also acknowledge that their participants did not have a lot of prior experience working with the technology, nor did they have an opportunity to improve their digital work based on adult feedback. Regardless, such findings speak to an implied difference in how young children respond to digital media as compared to more traditional measures for drawing purposes.

Together, the work of Matthews and Seow, Couse and Chen, and Picard, Martin and Tsao provide a deeper understanding of the implications of tablet computers in drawing and art making. Each research team took a slightly different approach to exploring a similar line of inquiry, yet each group provides a different conclusion

concerning tablet computers and their creative potential. Such findings will be discussed again in combination with my own interpretations in chapter five of this document.

Chapter Summary

In an effort to explore all perspectives circling my line of inquiry I have considered publications within various domains. I began by reflecting on the participants involved in this study and how they have been labeled in popular literature. I discuss such labels in conjunction with thoughts regarding cultural change, and I situate such change within the field of academia. I provide an overview of technology and its influences on learning, and summarize studies concerning tablet computers in the classroom. I then shift gears slightly by discussing child development in an effort to further understand my young participants. I provide a working understanding of learning, motivation, and the personal and moral development of young children. I highlight the social implications of learning, and specifically, the impact of adults and peers in development. This transitions into a discussion concerning social implications and artistic development. This is followed by further explorations regarding art, creativity, and aesthetics, which are all pertinent to my comprehension of artistic growth and development. This is shadowed by a review of three studies concerning tablet computers and art making. In the next chapter I discuss at length my research methodology, which was planned and orchestrated in an effort to further build upon the concepts and knowledge demonstrated in chapter two of this document.

Chapter Three: Methodology

The purpose of this study was to explore how young children use a tablet computer as a drawing tool. During this investigation I engaged children in various exercises that would shed light upon their perceptions of the tablet, how they use the tablet to draw, their conversations while drawing on the tablet, how they collaborate with peers using the tablet, and their preferences in drawing tools. Additionally, I collected data from parents and educators regarding their use of tablet computers and their perceptions of the tablet as a learning tool for young children. This study employed a basic qualitative research design utilizing data from surveys, art artifacts, videos, observations, interviews, and focus group discussions. The remainder of this chapter details my research process in which I discuss the research site, design, participants and sampling, instrumentation, data analysis, and my role as the researcher.

The Research Site

During the fall semester of 2011 I began a series of meetings with personnel at the Child Development Center of a mid-sized Midwestern university. These meetings with the center's director and educators led me to begin a small pilot study focused on digital art making. The study was completed for a qualitative methodology course I was taking and was designed to help me become more practiced in methodology. Because of this prior experience with the center I was welcomed again to complete my dissertation research, but this time accessing a larger population of preschool aged children, their teachers, and their parents.

The Child Development Center is housed near one of the campus' major libraries and is within walking distance to several university classrooms and residence halls. The center is designed as a comprehensive preschool that serves children as young as six weeks and up to five years old. The center separates children into different classroom spaces based upon age group and specialized needs. Each group is provided a descriptive title including:

Infants – six weeks to fourteen months of age

Toddlers - fourteen months to two years of age

Explorers – two years to three years of age

Discoverers - two and a half years to four years of age

Creators and Investigators – three and half to five years of age

A receptionist welcomes visitors as they enter the Child Development Center. While maintaining the safety and security of the center is a crucial task for this individual, she also utilizes downtime to move about the classrooms interacting with educators and children and assisting when needed. This individual works closely with the center's director who oversees all activity dealing with learning and development. The philosophy of the center is to create a warm and supportive environment in which each and every child has the opportunity to develop socially, emotionally, physically, and intellectually.

The infant and toddler groups at the center meet within their own walled spaces, while the remainder of the classrooms share one large space, which is separated using a variety of room dividers, bookshelves, and furniture. Four classrooms in total make up this large space, dedicated to the Explorers, Discoverers, Creators and Investigators.

Participant Selection and Sampling

Thirty-six children from the Discoverer, Creator, and Investigator classrooms consented to participating in this research. Two children declined consent and one child moved to another school early on during the research period. That child's data was dropped from the sample set. Seventeen of the children were girls and 19 were boys. There were nine three-year-olds, 23 four-year-olds, and four five-year-olds. Fifteen of the child participants were Caucasion, 19 were African American, and two were of Asian descent. As the study progressed, however, it became evident that the true sample size was smaller. In total, 30 child participants provided consistent data over the research period. These children were regularly in attendance during my visits to the research site. Of those, 14 were girls and 16 were boys. Seven of the 30 consistent participants were three-year-olds, 19 were four-year-olds and four were five-year-olds. Thirteen of these child participants were Caucasion, 16 were African American, and one was of Asian descent. A total of 35 parents consented to the research and 35 completed the parental survey. Two parents declined consent and one parent, who consented for his/her child, did not agree to participate and provide parental data. All four educators involved in the study provided consent and completed the educator survey.

I used purposeful sampling and approached the Child Development Center because I believed that the center was a prime source for preschool aged children with whom rich data could be collected concerning my research questions (Glaser, 1978). Once immersed within the research site and collecting data theoretical sampling began to take place in which I allowed emergent information to direct subsequent data collection steps. I formed codes from my raw data and practiced a constant comparative approach to

my analysis throughout (Glaser, 1992). I used regularly evolving codes to steer further collection of data, which helped form categories, properties, and dimensions. I modified research approaches to test my category development and to check for validity. I also looked closely at children who I felt represented interesting cases of artistic development, expressed extreme interest in the technology, or who responded to the materials presented in surprising ways.

Research Design

A basic qualitative design was used for this research. For Merriam (2009) the purpose of basic qualitative design is to understand how people make sense of their lived experiences. The three central characteristics of basic qualitative design include explanation of "(1) how people interpret their experiences, (2) how they construct their worlds, and (3) what meaning they attribute to their experiences" (p. 23). Other qualitative approaches were ruled out for this study based upon research goals. Phenomenology was deemed inappropriate because I investigated very young children during digital art making. It was because of my participants' age range that it was difficult to conduct phenomenological interviews. Ethnography was ruled out because the overarching purpose of this investigation was not to study through the "lens of culture" (Merriam, 2009, p. 29) but instead to consider how each individual child responded to the tablet as a drawing tool, and what implications those observations had on artistic exploration at large. While children's stories became a part of my investigations, such verbal contributions were minute snapshots offered during the process of drawing. Therefore, narrative research was deemed unsuitable. Critical research was also ruled out as a methodology because I did not attempt to "critique and challenge" nor "transform

and empower" (p. 34) the learning taking place in the chosen research site. Quantitative measures for this research were ruled out because I wanted to look at a small population of children, their teachers, and their educators, and observe the influences of the tablet computer within their community of learners.

While certain methodologies were deemed inappropriate for this particular study, it is important to note that basic qualitative design is flexible enough that researchers can utilize aspects of different methodologies to help their study achieve specific goals (Caelli, Ray, & Mill, 2003; Merriam 2009). As a result, it is not unusual to see basic qualitative research borrowing aspects of grounded theory, ethnography, phenomenology, narrative, and critical research, among others (Merriam, 2009). While grounded theory was not selected as an overarching research method I did employ grounded theory processes during data collection, analysis, and sampling for this research. Several reasons led me to this. First, I wanted to approach the selected field site with a sense of explorative discovery, allowing the data to determine the influences tablet computers may have on children's artistic production (Corbin & Strauss, 1990). Second, I hoped that any significant insights gained from this research would build upon current theories concerning artistic development like that of Lowenfeld and Brittain (1987), Hurwitz and Day (2007), and Kellogg (1969). Finally, I appreciate the data analysis measures associated with grounded theory, which involve a constant comparative approach. Practicing such a method allowed me to become fully immersed in the data.

Preliminary steps.

After receiving IRB approval, and the permission of the Child Development Center's director, consent was acquired among educators (see Appendix B), parents (see Appendix C), and children (see Appendix D). The process of inquiry began with the distribution of an educator survey (see Appendix E) and a parent survey (see Appendix F). These surveys were designed to gather pertinent background information concerning the experience and comfort levels of child and adult participants regarding tablet computers and similar technologies such as touchscreen phones. These surveys also provided information regarding the types of artistic activities child participants engaged in on a regular basis and how parents and educators facilitated such experiences.

The process of inquiry continued with frequent visits to the center in an effort to observe educators and children in action, and gain a sense of the center's culture at large. This allowed me and educators time to acclimate to one another and to establish rapport with child participants. I observed each of the three classrooms for about an hour at time once a week for three weeks, during which I completed observational field notes concerning instances in which teachers engaged children in artistic exploration or technology. This observational period provided a working understanding of educators, their teaching methodologies, and procedural processes, in addition to children, their personalities, likes, dislikes, and academic strengths. Interactions between children and teachers were observed, as well as interactions between children and peers. I noted how teachers set up their classroom environments, how they designed daily lessons, how they interacted with children, and how they addressed them verbally and nonverbally. I noted how children learned from their teachers through observational learning and guided

facilitation. I recorded how children reacted towards one another and I identified friendly peer relationships. I observed instances of prosocial and antisocial behavior among peers. I attempted to identify intrinsic and extrinsic motivators within each classroom environment and logged activities that children seemed to enjoy. Through these detailed observational field notes I attempted to document the learning in each classroom environment, the motivational factors that took root during children's encounters, and the types of verbal and nonverbal communications that took place on a regular basis.

Over time I began to discuss with the participating educators when to initiate introduction of the tablet with children. All three educators suggested a time within their weekly schedule in which children were regularly moving from learning station to learning station, working on tasks and activities in a less formal fashion. I made room in my schedule to accommodate the educators' requests and to ensure a pleasant and non-disruptive experience for the children and adults involved. This began the formal portion of the study in which I worked one-on-one with children as they sat before a tablet computer, working with a basic paint application, creating works of digital art. In the following pages I detail my protocol for each phase of investigation following my three weeks of initial observation. Phases one through three each took roughly three months to complete, averaging three visits per week, at least ten minutes per child. Phase four took approximately one month to complete, at least ten minutes per child for one-on-one interviews, ten minutes per class for each focus group discussion, and 30 minutes per teacher for adult interviews.

Phase one.

My first goal was to study how children render on a tablet computer using a basic drawing application. Each child participant was provided up to ten minutes, three times weekly, to create as many tablet drawings as they saw fit. During the beginning of this phase the children used my personal tablet computer, a Motorola Xoom®. The Xoom® tablet has a touchscreen interface which can be controlled by the touch of a finger or a stylus. The children used a basic drawing application called Picasso®, which is a free application available in the Android® application store. It was initially chosen because of its ease of use and accessibility. The Picasso® application provides five buttons along the bottom of the interface each with their own function. The icon to the far left allows the user to change the color of the background. The next, which resembles a color wheel, allows the user to change the color of their brush stroke. A paintbrush allows the user to change the thickness of the brush and choose from special drawing effects. An eraser allows the user to remove previous markings, and a back arrow allows the user to remove the last mark made (see Figure 1). In addition to these functions the user can load previously saved works of art, save their current piece, and share their work via an assortment of online and social media tools.

Figure 1. The Picasso® Application Available via Google® (2012)

Approximately one week into phase one I introduced the children to the iPad®. This tablet computer was acquired with the assistance of a grant awarded by the College of Education at the University of Missouri-St. Louis. While the grant was pursued prior to the beginning of the research period funds were not available until after the study had commenced. The iPad® tablet computer, like the Xoom® tablet computer, has a touchscreen interface that can be controlled with a finger or stylus. The primary difference children noted between the iPad® and the Xoom® was in regard to the Picasso® application itself. When opened on the iPad® this program looks quite different from the Android® version (see Figure 2). The Picasso® application on the iPad® has ten colored pencils at the bottom of the screen ranging from black to yellow, and an eraser. This version of Picasso®, compared to the previously used application on the Xoom®, was simpler in design and use. As such, an introductory period for this program was not necessary, as children intuitively took to the program.

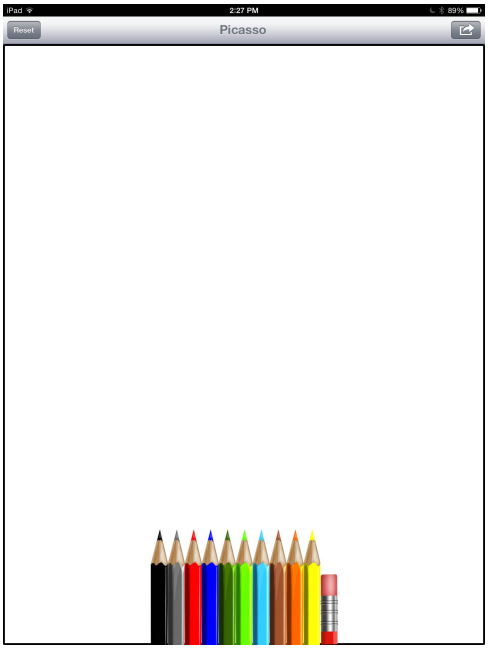

Figure 2. The Picasso® Application Available via Apple®

During their ten minutes of tablet time children were allowed to draw on the tablet as I observed and videotaped the experience. I used the following questions to encourage and motivate children.

1. What would you like to draw today?
2. Can you draw a picture with the tablet?

Phase two.

My second goal during this research was to investigate how children navigated the tablet computer while working in pairs to create collaborative works of art. Pairs were initially suggested by the classroom teachers and varied throughout the phase based on children's dynamics, attendance, and researcher curiosity. Children were given approximately ten minutes per visit to work in pairs drawing on the iPad® as I observed and videotaped the experience. Only when prompting was needed I used the following questions to encourage and motivate children.

1. What is something that you both have in common?
2. What is something that you both learned about today?
3. Can you draw the story of how the two of you met?

Phase three.

During phase three of my investigation I continued to offer children the opportunity to create one-on-one drawings. The primary difference between phase one and phase three was the introduction of traditional art making materials as an option during tablet time. Children were given the choice of working with the tablet computer, paper and crayons, or both during their ten-minute period. My goal in this was to discern

whether or not children preferred one tool over another. During each encounter I made detailed notes and video recorded the experience. At the beginning of each child's tablet time I asked whether they would work with the tablet computer or with the traditional media. Once the child decided which media they preferred, the unselected tool was placed to one side of the table. Since the unselected tool never disappeared some children alternated between tools. When this took place I documented the percentage of time allotted each drawing tool and compared and contrasted how each tool was used.

Phase four.

During phase four I interviewed children and educators. I also facilitated a focus group discussion with each class involved in the study. An interview protocol for children (see Appendix G) was prepared in an effort to elicit valuable information regarding children's perceptions of the tablet as a drawing tool. These questions were used during individual interviews with children and, with the exception of questions one and five, during focus group discussions (see Appendix H). Interviews and focus group discussions took no longer than ten minutes.

During my conversations with children it was important to remain aware of how I questioned and responded to children, so as not to influence participants' contributions. As an adult, children may have interpreted my verbal contributions or nonverbal reactions in a way that steered their answers. In order to address this I videotaped myself during the first week of phase four and played those videos for adult peers. My peers analyzed my questioning strategies and my body language and provided feedback. As a result of this feedback I made changes to my interviewing approach during following

weeks. I listened more and spoke less. I also sat in a neutral pose with my hands folded in my lap. These measures were taken to minimize researcher influence.

Following interviews and focus group discussions with children I organized individual conversations with educators to gather their reflections of the tablet as an educational tool. An interview protocol for educators was developed (see Appendix I) to elicit such information. These interviews took no longer than 50 minutes, were documented using a handheld voice recorder, and later transcribed.

Instrumentation

Several methods were used to collect data. These included surveys, art artifacts, videos of children drawing, observational field notes, interviews, and focus group discussions. Together, these data collection measures helped document how young children, their educators, and their parents responded to a tablet computer.

Surveys

Thirty-five surveys were completed by the children's parents and four surveys were completed by the children's teachers. Parent insights were recorded using a survey protocol (see Appendix E) with 15 questions. Three questions invited a simple yes or no response, five questions provided a Likert scale, and seven were open ended. Questions pertained to household ownership and use of tablet computers and smartphones, in addition to art making in the home. Educator insights were recorded using a survey protocol (see Appendix F) with 16 questions. Four questions invited a simple yes or no response, three questions provided a Likert scale, and nine were open ended. Questions

pertained to ownership and use of tablet computers and smartphones, use of such technologies in the classroom, and art making in the classroom.

Art Artifacts

In total 355 art artifacts were collected over the 15-week research period. Art artifacts are defined as either digital or traditional drawings created by the children. During phase one, when only the tablet was offered as a drawing tool, 119 digital drawings were collected from children. During phase two, when children worked in pairs to create collaborative drawings with the tablet, 88 digital drawings were collected. During phase three, when children were given the choice of working with the tablet or paper and crayons, 84 digital drawings and 64 paper and crayon drawings were collected. In total 291 digital drawings and 64 traditional drawings were created by the children who participated in the study. Each of these were archived electronically.

Videos of Children Drawing

Throughout phases one, two, and three children were video recorded while participating in the study. These recordings were collected not only to document the process of drawing, but also to capture the oral conversations that were shared during the research experience. During the beginning of this research a GoPro® camera mounted on a small tripod was used to record each drawing session. While efforts were made to ensure that only the tablet screen and children's hands were within view of the camera, its wide angle lens made this difficult. Once the iPad® tablet was acquired with grant funds I began to use the Xoom® tablet to document video recordings. Using the Xoom® instead of the GoPro® allowed me to position the tablet's camera directly in front of the

children as they drew. I pointed the Xoom® towards the children's hands and acquired anonymous videos in this way.

During phase one each child was video recorded individually as he or she drew on the tablet computer in the Picasso® application. During phase two children were recorded in pairs as they drew on the tablet computer collaboratively. During phase three children were again recorded individually as they drew on the tablet or with paper and crayons. In total 33 hours and 25 minutes of video was recorded during phases one, two, and three. Each video was transcribed to document and analyze children's oral stories as they drew.

Observational Field Notes

Prior to phase one's implementation of the tablet computer observational field notes were compiled on a weekly basis to record my general observations of the center at large and the three classrooms where I would be working. I continued to keep these notes while watching children draw during phases one, two, and three. I recorded children's nonverbal actions in real time and noted evidence of observational learning. Often children observed others working on the tablet, or stopped to watch a peer draw digitally while en route to another classroom activity. This act of watching peers as they interacted with the tablet as a drawing tool influenced some children's drawings. These notes were transcribed and placed in a detailed data table with accompanying artwork and transcripts from each child. Organizing my observational field notes and other data pieces in this way provided the context for each encounter.

During phase two, when children worked in pairs on the tablet, I made observational notes regarding how they navigated the tablet screen together. I considered each individual child's varying degree of expertise regarding drawing and tablet

technologies. I listened to their conversations and recorded their problem-solving strategies. I noted who controlled the tablet, when, and for how long. I also recorded instances when I needed to intervene and diffuse situations in which children would become hostile, mostly displaying frustration with the act of sharing.

During phase three, when children were afforded the choice of working with the tablet or paper and crayons, I made observational notes comparing and contrasting how they used the different tools available. I also noted how long children worked with the tablet as opposed to the traditional materials.

Interviews and Focus Group Discussions

During phase four I interviewed the children and their educators. The protocol for interviewing the children (see Appendix G) was designed in order to record children's understandings of the tablet as a drawing tool, and to measure any sort of tool preference that may exist. A total of 47 interviews with children took place, lasting no more than ten minutes each. Thirty children were interviewed once and 17 were interviewed twice. Second round interviews were conducted because several children were absent during the first week of phase four. In order to ensure that all children had an opportunity to reflect and answer the interview questions, the same protocol was used during week one and week two. Those children who were interviewed twice produced almost identical responses, demonstrating that they interpreted the protocol questions consistently. In addition to one-on-one interviews, each child participating in the study took part in a brief focus group discussion along with fellow participating classmates. Three focus group discussions in total took place among the Discover, Creator, and Investigator classrooms. A focus group protocol (see Appendix H) was designed in order to look for

patterns children's responses. Audio recordings were collected from each interview and focus group discussion using a handheld voice recorder and later transcribed for analysis.

A protocol for interviewing the educators (see Appendix I) was designed to validate findings and to gauge adult interest and comfort level with the tablet as an educational tool. Three of the four educators who consented were interviewed. The fourth educator was not available for an interview due to scheduling concerns. Audio recordings were collected from the three educators interviewed and then transcribed.

Storing and Sorting of Data

All raw data including jpeg image files of drawings, mp4 videos of children working on the tablet, and mp3 audio files of interviews and focus group discussions were organized and archived on a computer protected with personal passwords. Files were routinely deleted from the original recording devices. Additionally, a digital audit trail was maintained and included observational field notes, analytical memos, and other analysis measures. All files were backed up on a local hard drive in addition to a personal password protected Dropbox® folder. File names were coded with pseudonyms in order to mask the identity of those participating in the study.

A CD of each child's artwork along with a commemorative video was prepared and distributed to his/her parent. These CDs were distributed because parents exhibited an interest in seeing and archiving their children's work from this research. Raw video, audio, transcripts, field notes, analytical memos, or other analysis measures were not shared on CDs.

Data Analysis and Verification

Analysis of data relied on a constant comparative method in which data was immediately analyzed in an effort to define and direct subsequent observations, interviews, and artifact collection (Merriam, 2009). Merriam notes three distinct phases of coding in grounded theory: open, axial and selective, each of which took place during the analysis process.

"Open coding is what one does at the beginning of data analysis…tagging any unit of data that might be relevant to the study" (Merriam, 2009, p. 200). All textual data, including observational field notes and transcripts, underwent open coding. Using Microsoft Word® software and track changes, each piece of data was reviewed at least three times, and relevant elements were tagged with strategic one to two word labels succinctly describing the observation. Labels used during the beginning of the research period included the following, illustrated in Table 2.

Beginning Labels	
Representational drawings	Social influences
Non-representational drawings	Hesitance to the technology
Visual culture reference	Using the tool in exciting ways
Unusual subject matter	Tablet as a gaming tool
Patterns in subject matter	Tablet as a video tool
Digital preference	Ease of use
Traditional preference	Tool confusion
Interest in both technological and traditional approaches	Replication
Limitations of the technology	Novelty
Benefits of the technology	Value

Table 2. Beginning Labels

Visual data was also coded in this way. Each piece of artwork was reviewed at least three times during open coding and notes were made regarding those that represented unique or interesting cases of artistic exploration.

Axial coding followed which "is the process of relating categories and properties to each other, refining the category scheme" (Merriam, 2009, p. 200). During this phase beginning labels were revisited and refined, and a detailed code chart was developed including categories, sub categories, and examples of observed instances that represented each category. With each new piece of data collected I re-evaluated this chart to ensure that my categories accurately portrayed the data I was collecting. The initial labels of 'visual culture influences' and 'unusual subject matter' for instance were eliminated from the list because evidence of their existence was not enough to warrant further exploration. Some categories were combined because their titles proved to be too similar in nature, or they were re-defined as sub-categories. For instance 'representational' and 'non-representational drawings' were combined to create the category 'evidence of artistic development.' Also 'tablet as a gaming tool' and 'tablet as a video tool' became sub-categories for the category 'perceptions of the technology.' Similarly 'traditional preference' and 'digital preference' became sub-categories of 'media preference.'

Six final categories resulted from these analyses illustrated in Table 3. They were: perceptions of the technology, media preference, social power of the tablet, benefits of the technology, limitations of the technology, and evidence of artistic development.

Category	Sub-Categories	Properties	Dimensions
Perceptions of the technology	Tablet as a gaming tool	Statements regarding	Seldom to often
	Tablet as a video tool	Statements regarding	Seldom to often
	Tool confusion	Trying to use a crayon on the tablet or a stylus on paper	Seldom to often
	Novelty	Loss of interest in tablet activity	Seldom to often
Media Preference	Digital preference	An eagerness to use the technology/curiosity	Low to high
	Traditional preference	Hesitance towards using the technology	Low to high
		High value	Low to high
	Interest in both technological and traditional approaches	Use of both tools	Heavy digital to heavy traditional
Social power of the tablet	Tablet as social enhancer	Positive interactions among participants	Somewhat influential to very influential
	Tablet as social impediment	Negative interactions among participants	Somewhat influential to very influential
Benefits of the technology	Ease of use	User friendly capabilities	From form to function
	Drawing Options	As perceived by children	Being able to erase versus not being able to erase
Limitations of the technology	Ease of use	Assortment of capabilities	On task versus not on task
	Permanence	In regards to art making	To save or not to save
	Drawing Options	As perceived by children	From space to color selection
	Tool failure	iPad versus application	Minimal to detrimental
Evidence of artistic development	Representational drawing	Recognizable subject matter	Preschematic to schematic
		Conversations regarding the art making experience	Simple to sophisticated
	Non-representational drawing	Non-recognizable subject matter	Pre-scribbling to scribbling
		Conversations regarding the art making experience	Simple to sophisticated
	Patterns in subject matter	Regularly drawing subject matter	Often to repetitively drawn

Table 3. Final Categories, Sub-Categories, Properties, and Dimensions

Regarding perceptions of the technology I recorded evidence of the tablet as a gaming tool, as a video tool, tool confusion, and issues of novelty. Regarding media preference I looked for evidence of digital preference, traditional preference, or interest in both technological and traditional approaches. Under social power of the tablet I looked for evidence of the tablet as a social enhancer and as a social impediment. Regarding benefits of the technology I considered the tablet's ease of use and drawing options. Under limitations of the technology I also looked at ease of use, but also issues of permanence, drawing options, and tool failure. Regarding evidence of artistic development I considered moments when children created representational drawings and moments when they created non-representational drawings. I also noted patterns in subject matter.

Throughout the development of categories and their accompanying sub-categories, properties, and dimensions I looked for patterns in the data and made hypotheses regularly. Once I had completed open and axial coding, and saturation had occurred among all categories, selective coding took place. I formed the core category 'patterns in digital art making.' This core category, its sub-categories, properties, and dimensions is what connected all other categories. Among patterns in digital art making, I specifically looked at a phenomena I refer to the 'digital disconnect' in which differences were observed between how children interacted with traditional materials as compared to the tablet. I also looked at another phenomena I labeled 'replication' in which I observed children mimicking their traditional drawings with the tablet and vice versa (see Table 4).

Core Category	Sub-Categories	Properties	Dimensions
Patterns in digital art making	A digital disconnect	Differences between traditional drawings versus digital drawings	Low to high
	Replication	Digital drawings that mimic traditional drawings and/traditional drawings that mimic digital drawings	Often created or seldom created

Table 4. Core Category, Sub-Categories, Properties, and Dimensions

Several steps were taken in order to measure and validate the data. The category chart, with the addition of relevant data, was shared periodically with my dissertation committee members. By sharing this information with experienced researchers from a variety of educational fields I strove to ensure that my method for interpretation was accurate and efficient. I also shared this information regularly with peers during informal conversations. By discussing my category development with other doctoral candidates I received valuable feedback that encouraged regular revisiting and revision of my properties and dimensions. Additionally, I shared this initial analysis with the four educators participating in this study who not only gleaned a deeper understanding of my intentions as a researcher, but also verified that the patterns I was seeing were accurate. Finally, I regularly triangulated my data collection measures and re-analyzed individual pieces of data to ensure that chosen words and labels accurately represented lived experiences.

Role and Placement of the Researcher

Immersing myself within the Child Development Center required much more than an observer role. In order to become a respected figure within the center I needed to earn the esteem of the center's children, parents, and educators. To do this I took on a participant observer role. Such a role was multifaceted. In addition to visiting the center to collect data and explore my research questions I often came early or stayed later in the day to assist with everyday classroom tasks. This demonstrated my interest and investment in the site. During moments in which the classroom educators had the attention of the children I observed their teachings and assisted when asked. During transitional periods, such as outdoor playtime, bathroom breaks, cleanup time, and lunch, I offered additional assistance in the way of set-up and supervision. During special presentations I participated in activities alongside the children to demonstrate my curiosity. In all of these ways I was able to gain the respect and trust of all parties involved while also acquiring a deeper understanding of the center, its classrooms, and daily activities.

Researcher bias.

Given my background knowledge in education and artistic development during my undergraduate years, my teaching experience at the secondary level, and my present work at the higher education level researcher bias was regularly a concern during this investigation. While it was difficult to maintain an entirely objective approach because of my background, I believe that my experience in education prepared me for some of the unknowns that present themselves when conducting research in a classroom setting. When working with children it is very important to remain flexible and there were several

times in which I had to change my research schedule because of an impromptu field trip or a special presentation from an outside group. Even excess absences became a concern among some participants. As an educator myself I know that these are the realities of teaching and I was prepared to accommodate to my participants while also collecting the data necessary for my research.

Reliability and Validity

Considering my prior experiences as an educator, means were taken in order to address researcher bias and to ensure the reliability and validity of this study. To ensure research is valid and reliable Merriam (2009) suggests providing rich and thick description, conducting regular triangulation of data, performing ongoing member checks and peer reviews, reflecting on the researcher's position before, during and after research, preparing a detailed audit trail documenting the research process, and achieving variation as well as saturation in data. All of these suggested measures were followed in order to increase the reliability and validity within this research project.

First, tremendous efforts were made to clearly communicate the purpose, processes, risks, and benefits of the research with all participants. Second, triangulation of data occurred among surveys, art artifacts, video recordings, observer notes, interviews, and focus group discussions. Third, I regularly sought respondent validation from participating educators through periodic discussion regarding my process of research and initial analysis of data. I also sought peer feedback to ensure that I was interpreting data in an objective manner. I did so by sharing initial findings and analysis during monthly peer groups in which two to three fellow doctoral students provided valuable insights. I also asked peers to watch videos collected during phases one through

four. Using reliability protocols (see Appendix J, K and L) peer reviewers were asked to identify moments in which I verbally or nonverbally influenced child participants during the digital drawing encounters, traditional drawing encounters, or collaborative experiences. To address concerns of internal validity, and to negate concerns of attrition, data collection for each child occurred during a short 15-week timeframe. In a final effort to ensure reliability and validity I reflected regularly upon my role as researcher and the impact I may have had on data throughout the data collection

Chapter Summary

Chapter three was written to describe the methodology used for this research project. Extreme transparency was attempted when describing the research site, design, participants and sampling, instrumentation, approaches to data analysis, and the role of the researcher. In the following chapter I share the findings of this research.

Chapter Four: Results

The purpose of this study was to explore how young children use a tablet computer as a drawing tool. This study utilized a basic qualitative design with grounded theory measures for data analysis. This chapter reports the results from this research, which included 35 parent surveys, four educator surveys, 355 art artifacts, 33 hours and 25 minutes of video documentation, 47 interviews with children, three educator interviews, and three focus group discussions with children. Regarding children, data was collected in an effort to determine how they use the tablet computer as a drawing tool, how they collaborate with peers when drawing on the tablet in pairs, whether they have preferences in art making tools, and their general perceptions of the tablet. Regarding parents, data was collected in an effort to determine home use of the tablet computer, or similar devices like touchscreen phones, in addition to learning how parents encourage their children's artistic exploration. Regarding educators, data was collected in an effort to determine home and classroom use of the tablet computer, or similar devices like touchscreen phones, and artistic practice. This study was designed to answer the following research questions:

1. What prior knowledge do children have regarding tablet computers and similar technologies?
2. How may drawings created on a tablet computer show evidence of a child's artistic development?
3. How do children draw on a tablet computer compared to traditional media, like crayons on drawing paper?
4. How do children navigate a tablet computer when drawing in pairs?

5. Do children exhibit preferences in drawing tools? Do they prefer the tablet computer over traditional media such as crayons on drawing paper?

Preliminary Data Collection

Once IRB approval and consent from children, parents, and educators was acquired the inquiry commenced with the distribution of surveys. While awaiting survey results I visited the center weekly to observe and become acclimated with the educators and children involved. Detailed observational field notes were written to document my initial experiences in the classroom. I made drawings of the center and the three classrooms involved. I documented the educators and their teaching styles. I observed the children to become acquainted with their likes, dislikes, and social encounters. In the following pages I share findings pertaining to surveys and observational field notes.

Surveys

The surveys revealed that 31 out of 35 parents owned a tablet computer and 15 of those individuals used them on a daily basis for such activities as checking email, browsing the Internet, playing games, viewing social media, shopping, watching videos, or listening to music. Thirty-three of the parents noted that their child also had access to the tablet computer, and 11 detailed that access was daily. The most commonly listed activities for children on the tablet included games (24 responses), and watching videos (20 responses). Other responses such as drawing, coloring, reading, and listening to music received between one and four responses, representing less frequent activities on the tablet computer. When asked about the types of artistic exploration encouraged in the home, parents' responses varied. Twenty-two said "very much," nine said "somewhat,"

three were "neutral," and one said "not really." Of the art making materials accessible in the home, those noted most often were crayons, markers, colored pencils, paint, and Playdough®.

Other interesting findings emerged from the collection of parent surveys. In response to children's access two parents said that their children were not granted access to a tablet, however, they did use a Leapfrog® on a regular basis. A Leapfrog® is a similar device to the tablet in terms of its touchscreen interface, but it is also designed to be child friendly. It seemed that for these two parents the Leapfrog® varied from popularly purchased tablets like the iPad®.

Also notable were parents' responses to the final question in my survey protocol. That question asked that parents "describe the types of things your child likes to create using art materials." Instead of providing the subject matter of their children's artwork, which is what I had anticipated, parents provided media-based responses. For example, the most common responses included paintings, drawings, and use of coloring books. Only two parents mentioned that their children enjoyed making digital art. Detail regarding how such digital art was made and with what tools was not disclosed. It is likely that parents did not interpret this particular question as intended. In a future study, such a question might be revised to ask "describe the subject matter of your child's drawings and their manner of creation."

Educator survey data revealed that two educators had access to their own personal tablet computers and two did not. Of the two educators who had access one noted that she used the device "very much" and the second noted that she used the device "somewhat." Uses among these educators included research for lessons, social networking, email,

record keeping, and personal gaming for themselves and family members. While personal ownership varied, all four educators had access to iPad® tablets in their classrooms provided by the Child Development Center. They used these iPad® tablets to access various educational applications, games, and videos, to document student work, and to provide extension work, in which children were allotted additional time and attention when learning new or key concepts. Educators were asked the question, "do you feel the tablet computer has implications for student growth in the pre-school classroom? If so, how? If not, why?" Several responses were offered. One educator said, "I see it as a good supplement to the authentic lessons we have in the classroom. It is especially useful in pulling up information that we may not have in any of our books" (survey response, 2.3.14). Another educator noted that, "yes, it can be used as a tool for learning new skills and extension activities" (survey response, 2.3.14) for additional help in areas of need or as a supplementary activity. One educator said, "I do feel it has implications, but not until I can be more educated on its uses within our curriculum" (survey response, 2.3.14). This alluded to a lack of confidence in some educators.

Educators were also surveyed regarding the amount of art making their students partake in. All four educators enthusiastically responded to this inquiry with "very much." Students throughout the Child Development Center are provided access to a plethora of materials including paper, pens, pencils, crayons, colored pencils, markers, watercolors, collage materials, scissors, glue, tape, chalk pastels, oil pastels, stampers, clay, PlayDough®, and digital cameras. Students have access to these materials during both structured art lessons and open exploration time in which they have the freedom to move among a variety of hands-on teacher-orchestrated learning stations. Additionally,

all three participating classrooms have between two to four large easels that are regularly filled with fresh paper and tempera paint. When asked about the type of markings students create when partaking in artistic experiences, educators' responses were very similar; they recognized different stages of artistic development in their students. One educator's response summarized the consensus among the four surveyed. She said,

> My students' artistic abilities range from basic bodies and shapes to more realistic renderings. Some are still in scribble mode forming a basic head, arms, legs, bodies, and shapes. Some are more advanced and detailed in their drawings, even adding to backgrounds. (survey response, 2.3.14)

According to the educators surveyed their students vary from the scribbling mode to the preschematic stage of artistic development.

Observational field notes.

It took roughly one week for parents and educators to complete and return the surveys for analysis. During that time I began visiting the center and the three participating classrooms. This observation period lasted three weeks. This time not only marked a crucial period when valuable rapport was established among participants, but it also allowed time to observe educators and children in action. I made detailed observational field notes throughout the lived experience and wrote analytical memos following my visitations. Next, I summarize my observational field notes from this preliminary period, describing each classroom environment observed and the center at large.

The Discoverer classroom.

Unless it is lunchtime or naptime the Discoverer classroom is regularly a bustle of energy and activity. Cindy is the instructor and she takes a thematic approach to her daily instruction and organizes content based upon motivating topics that she has fielded over her many years of experience in the preschool setting. Observed themes included people in the community, sharing, and helping those in need. For each day of instruction Cindy orchestrates a variety of hands-on workstations that coincide with the selected theme. During station time I observed art making, reading, writing, counting, pattern making, sensory exploration, and collaborative activities. Cindy exposes the Discoverers to as many experiences as possible to appeal to all learning styles. Overall, I would describe Cindy's teaching style as nurturing, yet firm. She has a soothing voice and calming presence in the classroom. It is evident that her young students truly care about her, as they regularly provide hugs and show her their work when achievements have been made. This does not mean that Cindy is not authoritative when needed. When issues arise in the Discoverer classroom due to diverse personalities, misuse of materials, or failure to follow established rules, Cindy addresses matters calmly and swiftly.

Like her highly organized curriculum Cindy's classroom space is expertly arranged, clean, and accessible to her young students (see Figure 3). At the front of the Discoverer classroom is a small stage just a few steps up from the floor where Cindy addresses her students as a large group. This is a place where Cindy can provide important directions, read a storybook, or review key concepts. There are three large rectangular tables that are used to serve lunch as well as spaces for workstations. In addition to these three flat surfaces, children regularly rotate to the sensory table, drawing

easels, the large carpeted area in the back of the room, as well as the extra table located near the play kitchen set. Students move freely from space to space; however, when Cindy anticipates a problem or observes a station that is saturated with students she is quick to reorganize.

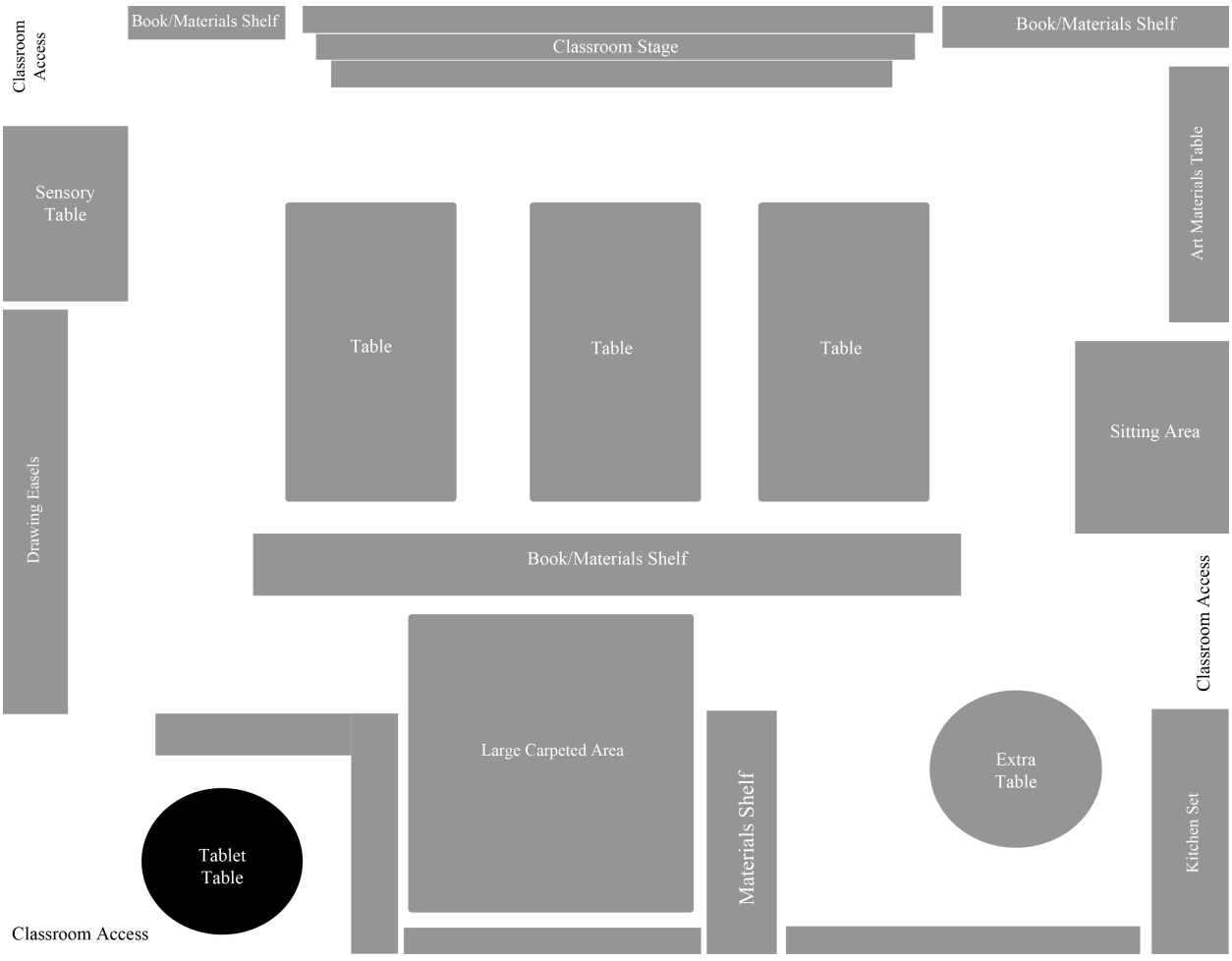

Figure 3. Discoverer Classroom

Of the original group of 36 children invited to participate in research 15 are students in the Discoverer classroom. They represent a diverse population, varying in gender, ethnicity, and personality. Nine of the students are girls and six are boys. A

majority are three years of age, with a few four-year-olds among the group. Overall, the Discoverer classroom represents the youngest group of children among the three classrooms accessed.

The Discoverers were incredibly welcoming and eager to learn more about me. As soon as I walked into their classroom each week they would greet me enthusiastically and yell "the tablet lady is here!" Such a title was coined by Kevin, an exuberant boy in the group, and caught on fast. Soon, all three classrooms referred to me as the "tablet lady." Cindy welcomed me with similar enthusiasm, as I had worked with her in the past during several other studies. We share a mutual respect for one another based upon prior experience.

While observing students in the Discoverer classroom I paid close attention to their social interactions with one another. Nine of the students regularly exhibited prosocial behaviors. These children are happy and easy going. They exhibit little issue when sharing materials or experiences, and seem to enjoy opportunities when they can assist their peers or the adults in the room. Six children exhibited antisocial behaviors on a regular basis. These children cry periodically and regularly exhibit frustration with peers or adults in the room. These children struggle when sharing materials or experiences, and they can be argumentative at times. Those children exhibiting prosocial behaviors proved more likely to take part in observational learning, as they work well with others and are careful listeners. It was not unusual to observe prosocial children quietly observing their peers working while waiting for a particular station or material. On the other hand, those children who exhibited antisocial behaviors are less likely to take part in observational learning. These children seem to be more independent in their

learning, perhaps because of issues of patience. Since these students struggle with sharing materials or experiences, they often move on to another activity instead of waiting and watching peers in action.

Despite these differences in social skill-sets, it is difficult to identify strong friendships among the Discoverer group as a majority of the children play well together. There are, however, two interesting cases. Jon and Andrew, for example, can regularly be found chatting about super heroes and mimicking a recent cartoon episode they watched at home. There is also Lyn and Tricia who share an affinity for Disney® princesses. These two pairs of peers are the only ones who are consistently observed playing with one another, so much so, that Cindy sometimes separates them in order to encourage other social encounters.

The Creator classroom.

The second classroom observed was that of the Creators, led by Susan and Tiffany, who team teach their 14 students. Six of their students are girls and eight are boys, and a majority of them are four years old. Susan and Tiffany's teaching styles compliment one another nicely. Susan may be described as more of the authority figure, while Tiffany is more comforting and motherly. When tense issues arise though, neither hesitate to redirect their young students.

The Creator classroom (see Figure 4) is very similarly organized to that of the Discoverers, with the addition of a large playhouse and a sensory area comprised of a series of panels and screens which children can hang various objects like plastic chains, ribbon, and yarn. They too have a stage for children to sit on during large group

instruction and various tables used for workstations. The Creator classroom is accessible from two areas of the center.

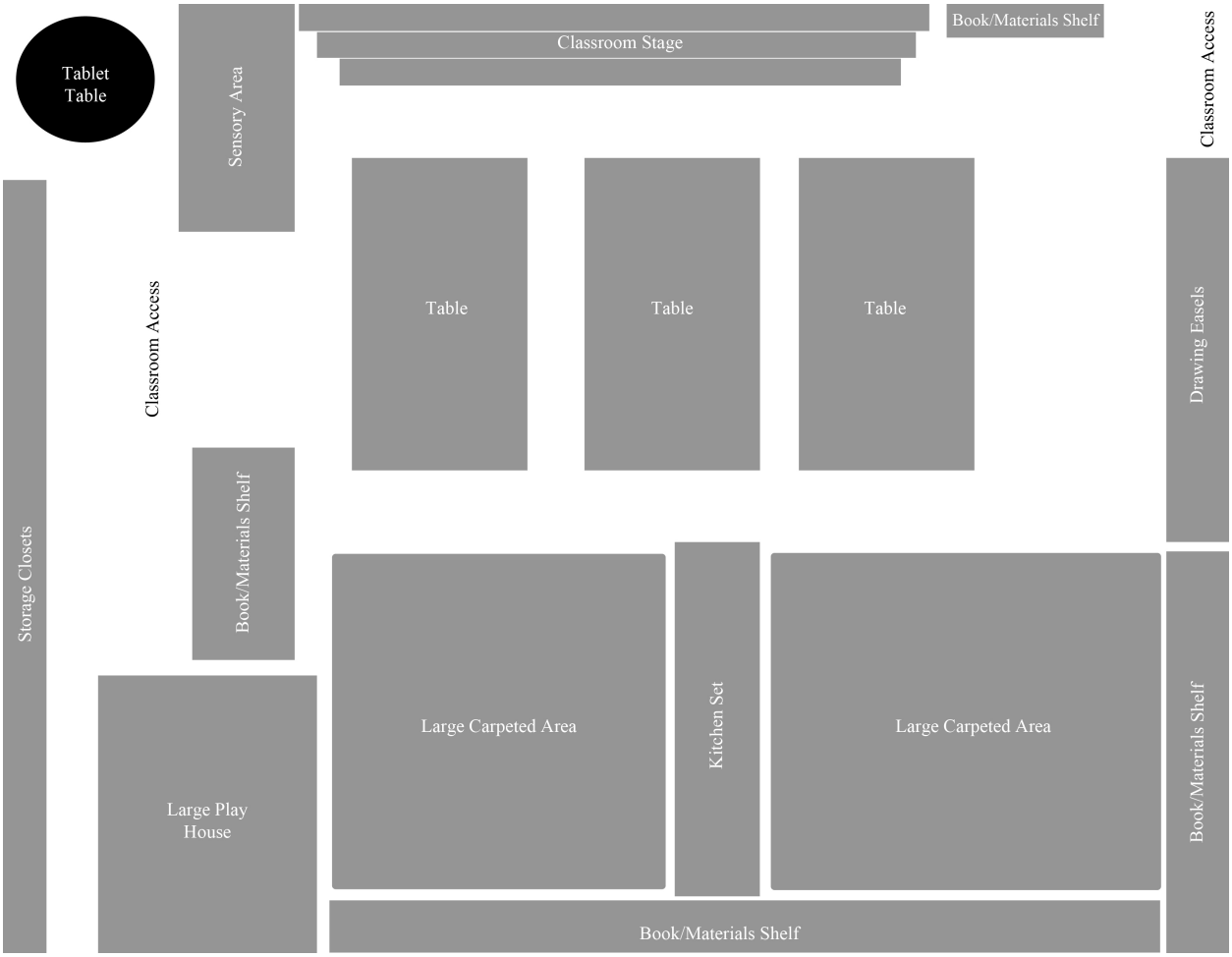

Figure 4. Creator Classroom

Also like Cindy, Susan and Tiffany organize their curriculum around selected themes. Some of the themes I observed during my weekly visits included how we show affection for one another, how we can work together as a team, and resources in our community. Susan and Tiffany use the Creator classroom effectively and efficiently as they orchestrate a variety of daily activities centered on the chosen theme for the week.

Children are regularly encouraged to use the classroom easels to paint, the sensory table to explore tactile materials, and the tables for reading, writing, counting, pattern making, and more. When children finish with thematic tasks they are granted time to explore freely. Children can often be found during this time climbing the large playhouse, playing dress up, or making an imaginary meal in their kitchen set.

Similar to my experience with the Discovers it took little time to become acclimated with the Creators. With the exception of one child named Carrie, children were very curious to know more about me, and what I would be doing with the tablet computer. Carrie was somewhat hesitant in getting to know me, perhaps because she was relatively new to the center herself and was getting to know everyone, children and adults alike. Over time her shyness subsided and I learned that she harbors a love for drawing and creating. The educators also became comfortable with my presence quickly. Like Cindy, I had worked with Tiffany on a few past studies. Because of this prior experience she was familiar with my respect for the classroom. I mainly had to convey my intentions to Susan and engage her interest in the research. In order to do this I regularly offered my assistance during classroom activities and shared my own experiences as a practicing educator. In a short amount of time Susan began to welcome me just like her young pupils.

While observing the Creators, again, I paid close attention to their social interactions. Ten of the students regularly exhibited prosocial behaviors. These children were happy and easy going. They had no problem sharing materials or experiences, and often assisted their peers and the adults in the room. They also regularly took part in observational learning. Four children exhibited antisocial behaviors on a regular basis.

These children exhibited frustration with peers and struggled when sharing materials or experiences. One student displayed aggressive behavior when frustrated. Behaviors included crying, screaming, hitting other children or adults, and running from the classroom environment. Given this student's special needs, either Susan or Tiffany regularly kept a close watch in order to anticipate and prevent unwanted behaviors.

Since ten of the children in this classroom maintained prosocial skills it was difficult to identify particularly strong friendships. Casey and Cindy, however, are relatively inseparable. They love to work together, play dress up, and reference Disney® characters and Michael Jackson on a regular basis. Besides this particularly close friendship children freely play and interact with one another.

The Investigator classroom.

The Investigator classroom differs slightly from the other two described in its organization and its inhabitants. Jennifer, the educator in the room, has fewer students, only two girls and five boys. At the beginning of the research period there were eight students in Jennifer's class, however one young girl moved and transferred to another school. She was removed from the sample set and her digital drawings were destroyed. The Investigators represent the oldest students in the center. Half are five year olds and the others are four year olds. The classroom has a stage, several tables, a large playhouse, dress up area, and sensory table (see Figure 5). Jennifer has fewer easels in her classroom compared to the other educators and she explains that this is because children are more likely to draw in their sketchbooks on a flat surface, rather than on an object that is upright.

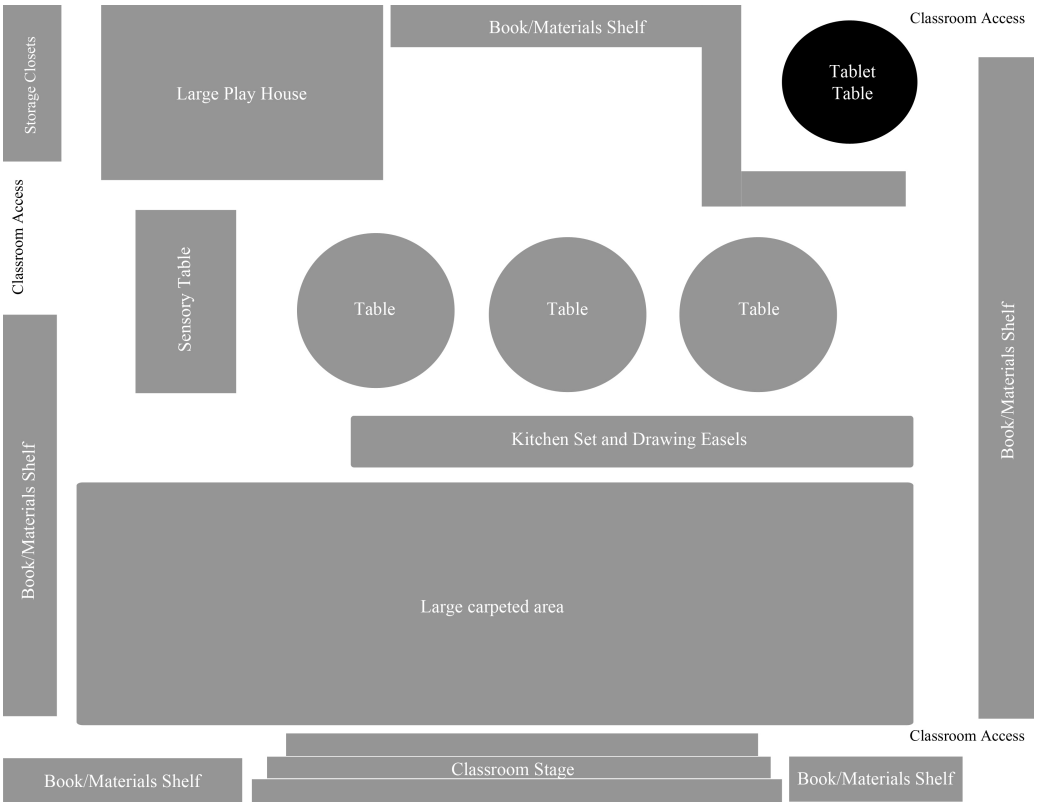

Figure 5. Investigator Classroom

While Jennifer strongly maintains the authority in her classroom environment, she is also very encouraging of student progress, loudly and proudly congratulating her pupils as they hit important milestones. Susan takes a thematic approach to her lessons, but her implementation varies from the other educators observed. While Cindy, Susan, and Tiffany regularly orchestrate a variety of stations in the classroom, Jennifer shows a greater appreciation for large group instruction. Perhaps this is because her class is so small. Jennifer often addresses her students while sitting on the stage or while they all crowd around one of the circular tables in her room. Jennifer employs this type of large group instruction regularly in an effort to prepare her students for kindergarten, and also to disperse important information and concepts to all students at once. Following this, her

students typically take part in the same activities in unison. These activities involve a variety of hands-on explorations, mainly artistic, or scientific in nature. When students complete required tasks they are granted time to explore areas of the classroom at their will. Such activity seems to vary from day to day and depending upon the mood of each child. The most popular areas are the sensory table, the block station, and the dress up corner.

Particularly interesting are the social dynamics of the Investigator classroom. As some of the oldest children in the center, Jennifer's students are very independent in their actions and their learning. They like doing things for themselves and are also easily frustrated if rules, whether explicit or implicit, are broken. My interpretation is that these responses are no more a result of antisocial behavior, but likely due to growing individualism. Of the seven children observed, only two struggle socially on a periodic basis. Antisocial behaviors include observance of pouting and the occasional argument. Yet, compared to their younger counterparts in neighboring classrooms, these antisocial behaviors are minimal in scope.

Another difference between the Investigators and children in the other classrooms observed are the number of established friendships. In this environment it seems that the older the child the more likely they gravitate towards specific peers. Carrie and Taylor, the only female students in the class, regularly dress as princesses or fairies, and hold tea parties together. Marcus and Niles are inseparable and regularly found building objects together, which they describe as characters from their favorite movies. Finally, Gavin and Sam sit near each other often and chat, even when completing entirely different tasks.

The center at large.

It is important to emphasize that the educators of the Child Development Center make an attempt to work harmoniously on a daily basis. Not only do they collaborate regularly to ensure that they are satisfying the needs of all students through curriculum and lesson development, they also regularly share materials and the center's space. As already noted, the center itself is one large room, a former gymnasium space that has been subdivided. Individual classrooms are identified through implied separation. Instead of walls space is demarcated by how bookcases and other furniture pieces are used as room dividers. As such, educators and children can easily see from one classroom to another. Figure 6 illustrates how the three classrooms observed lay in relation to one another.

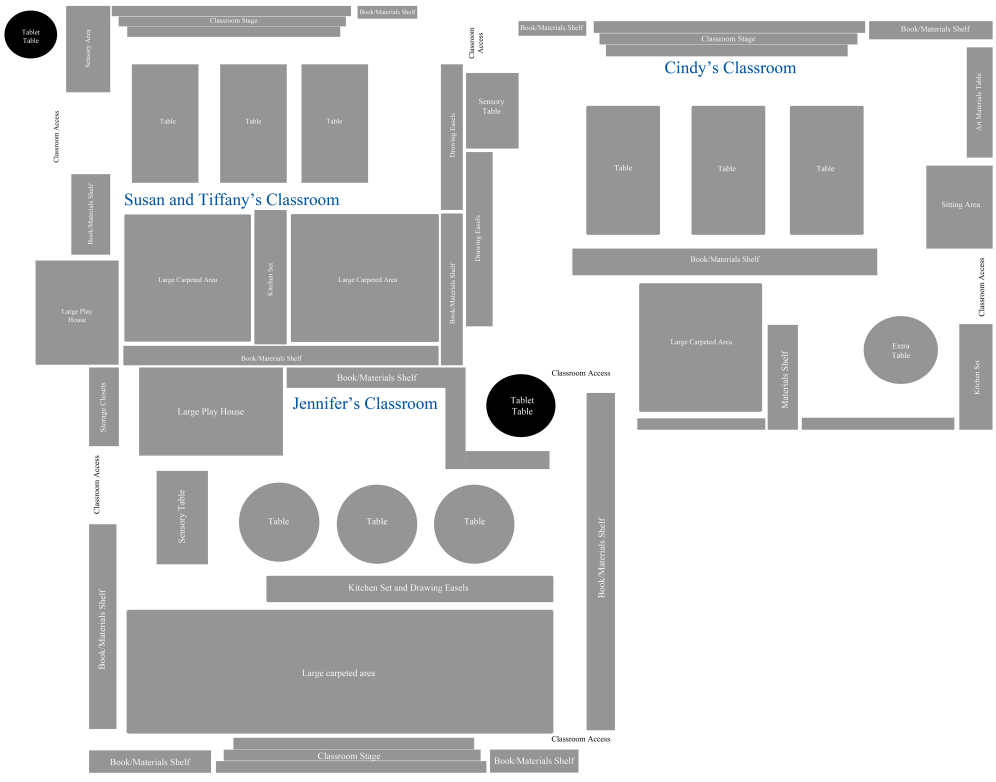

Figure 6. The Three Participating Classrooms

From the playhouse in the Investigator classroom students can easily see into the Creators' space, and vice versa. The bookcases and materials separating the Discoverer classroom from the Creator classroom are low enough that a conversation can easily take place among adults. Additionally, a small study nook between the Discoverer and Investigator classrooms make swapping materials between teachers seamless. Since physical walls do not separate the three classrooms one would anticipate that noise would be an issue. After visiting the center on a weekly basis, I realized that educators and children alike are accustomed to hearing the activity of nearby classes, which now serves as ambient noise.

One will also note from Figure 6 that whether working with the Discoverers or the Investigators I used the same round table for tablet time. This small study nook served as a secluded space where children typically did not enter without adult supervision. This space provided easy access to the classrooms, yet a bit of privacy to help retain student focus. Similarly, the round table accessed during the Creators' tablet time was located just outside their classroom space. Again, it was accessible, but just far enough away that students were rarely distracted by the activity of their peers.

In addition to the table I used with the Creators other items made up the perimeter of the center. The center's main entrance is located on the lower left hand side of Figure 6. Closets along every available wall serve as storage. There are also desks for educators and the occasional low table housing two to three desktop computers. Such tables are positioned outside of the Creator classroom and also the Investigator classroom, as these are the only educators who encourage computer usage among students. When offered time to work on computers I observed children playing educational games showcasing

bright colors and playful characters. When questioned casually Cindy was grounded in her position on computers in the Discoverer classroom. She discouraged this activity because she believed children benefitted more from face-to-face socialization with peers.

Also accessible from the interior of the center is a kitchen where an employee prepares breakfast, lunch, and periodic snacks for children. Near the kitchen entrance is an exit to an outdoor space where children can play on jungle gyms of all shapes and sizes and admire the center's garden. From an observer's point of view the Child Development Center is a warm, embracive, and all-encompassing environment where students are exposed to a variety of experiences and learning opportunities.

Once all survey data was collected and three weeks of observation had concluded, formal investigation of the tablet computer in a preschool setting began. As mentioned prior, I had arranged with each educator a research schedule that was conducive for all involved. In the following pages I summarize each of the four phases that took place in addition to the associated findings.

Phase One Data Collection

During phase one I visited each classroom once a week for one to two hours per room. I worked with the Discoverers on Tuesdays beginning each visit around 10:00 AM. During this time the Discoverers were typically engaged in station work and I was added as a station to which children rotated. Incorporation of the tablet in this way went very smoothly. I visited the Investigators Wednesdays around 9:30 AM. During this time children were usually finishing with their first round of large group instruction and working independently. I would then invite children one at a time to work on the tablet. Susan and Tiffany preferred an afternoon time slot for the Creators, so we arranged for

Wednesdays, after snack time, around 3:30 PM. During this hour students and educators were settling down after a long day. Children were allowed to play freely and, like Jennifer's students, I would call upon them one at a time. Data collection measures during phase one involved video recording each encounter, saving digital renderings produced during each sitting, and taking observational field notes.

The Discoverers were the first to work with the tablet during phase one. I approached the classroom setting unsure of how students would respond to the technology as a drawing tool. I sat down at the designated tablet table between Cindy and Jennifer's classrooms and set up. I placed the tablet flat on the surface and also positioned a GoPro® camera on a nearby shelf to record the experience. I called each child to the tablet table one at a time and described how we would spend our time together in child friendly terms. I told each child "we are going to spend time together drawing on the tablet computer. You can draw anything you like when you are over here. Would you like to start?" I always received an enthusiastic response from the young participants.

Originally I anticipated a transitional period in which children would need time to acclimate to the tablet, its tools, and its abilities. After showing each child how to turn the tablet on, how to open the Piccasso® application, how to create a new canvas, and how to change paint color, they were quite comfortable with the technology. For the first week of phase one children used my personal Xoom® tablet to draw. Once acquired about a week later, children used an iPad® tablet and a slightly different version of the Picasso® application. Children had little trouble adjusting to the new tablet and the new version of Piccaso®. While children seemed un-phased by our use of the tablet they were distracted by the GoPro® camera at first. When children discovered what it was and its purpose,

they would often walk past, wave, and say hello to the device. This distraction was fleeting, however, as the children became accustomed to our routine and the devices used.

In the following pages I discuss the unique findings from this phase through a series of stories. The main characters of these stories are child participants who represent my overarching observations, which include evidence of artistic development, children's perceptions of the tablet as a drawing tool, benefits of the technology, and, finally, limitations of the technology.

Evidence of artistic development.

During phase one of implementation I was not only surprised by how quickly children acclimated to the technology, I was also taken aback by the drawings children produced. During this investigation some children expressed themselves experimentally working primarily in a scribbling modality while others immediately created recognizable renderings, often accompanied by sophisticated back-stories. In this section I highlight several children who represented interesting observances of artistic development. One child, Samantha, represents the non-representational group of children who remained in a scribbling mode throughout the research period. Another child, Lyn, represents a unique group of children who seemed to be in between stages, creating representational drawings on paper but scribbles on the tablet. I also discuss Cassie, a young girl with a love for drawing representational renderings of objects and people. Finally, I share Jason's story, a child who loved to create drawings of super heroes. Many children within the study followed Jason's lead, creating regular drawings of figures and objects that they particularly enjoyed or related to. While these children serve as the main characters of

these stories others are also periodically described to further illustrate observed behaviors.

Samantha: Non-representational drawing.

At three years old Samantha is one of the youngest children in the Discoverer classroom and in the study sample. Samantha is physically small compared to her classmates and she speaks very little. When she does talk she is barely audible and difficult to understand. While children and adults alike make great efforts to communicate with Samantha she is unphased by this attention. She regularly has a smile on her face and gets along with each of her peers. She has no problem sharing and is one of the first to offer a friend with a warm embrace when they seem upset or struggling.

During my weekly visits to the center Samantha was always elated to see me. She gravitated towards the technology and hurriedly ran to the designated tablet table when her name was called. Throughout phase one and beyond Samantha continued to create non-representational drawings with the tablet computer. These drawings looked like scribbles to the adult eye with unrecognizable shapes and sporadic color usage. Her mannerisms during the act of drawing also alluded to the fact that she was still in a scribbling mode. It was not unusual for Samantha to look up at me and around at her surroundings while still moving her finger in a back and forth motion on the screen. Her discussions during the act of drawing were quite minimal. When asked "what are you drawing?" or "can you tell me about your drawing" Samantha provided succinct responses such as "this is my house," "that is my brother," "that is my dog," and "those are my toys." Samantha often drew her house and its contents, although this would have

been difficult for an adult, not privy to her description, to identify. Following are a few of her house drawings from phase one illustrated in Figure 7.

Figure 7. Samantha's Drawings of her House (created 3.4.14, 3.11.14, and 3.11.14)

While Samantha's drawings seemed to be in an early manipulative stage, the process of naming the objects within her drawings is significant (Hurwitz & Day, 2007). Samantha, like other children in the study, exhibited such a realization, that her drawings can represent real-life objects, people, and places. It can be predicted then that, very soon, Samantha will create more controlled renderings that also convey recognizable visual stories. For the duration of my 15-week study, however, Samantha failed to make any truly representational works of art.

It seemed that the younger children involved in the study were more likely to remain in a scribbling modality with the tablet longer than older peers. Based upon known theories of artistic development this is not unusual, as these first explorative measures are an important process in learning. In fact, Hurwitz and Day (2007) note that "no one leaves the manipulative stage entirely" and particularly, when presented with a new tool "we are likely to perform some manipulation before we begin to work in

earnest" (p. 50). For children like Samantha, this manipulative stage seemed to last longer compared to other children in the study.

While children like Samantha did not have time to graduate from the scribbling stage within the lifespan of this study, other children did. I think of Sara (three years old) who made great strides in her visual representation. Below I provide two drawings Sara created of a person, the first from the beginning of phase one, the second, later on in the study.

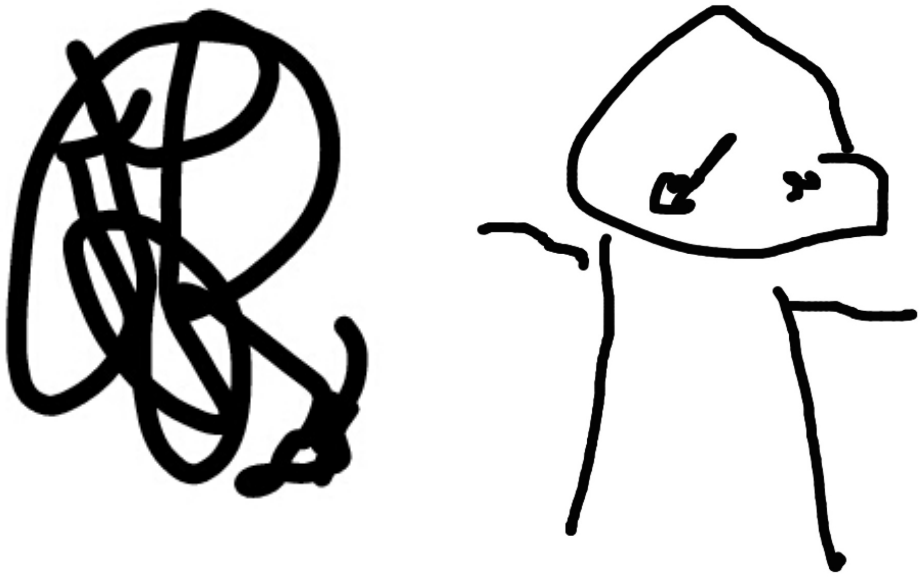

Figure 8. Sara's Drawings of People (created 2.25.14 and 4.15.14)

Like Samantha, Sara was one of the youngest and smallest children involved in the study. Unlike Samantha, Sara progressed further in her artistic growth in the allotted timeframe. One will note in the above drawings more controlled mark making and detail in the face in Sara's later rendering.

Another child who provided a unique case of artistic development was Lyn (four years old). While Samantha and Sara represented two different instances of scribbling, Lyn presented a particularly surprising case of scribbling that prefaces my description of a digital disconnect discussed later on in this chapter.

Lyn: A state of limbo.

Lyn is one of the oldest students in Cindy's classroom. As a four-year-old, very close to turning five, she is an implied leader in the room. Children naturally gravitate towards Lyn for leadership and she is happy to oblige. She is a careful listener and a skilled communicator. She regularly delegates tasks and has no difficulty sharing objects or classroom responsibilities.

When it came to her digital renderings during phase one I was not surprised to see Lyn work in a scribble modality. Particularly during the beginning of tablet implementation most children experimented with the new tool, producing unrecognizable drawings, seemingly mesmerized by how the simple swipe of a finger could render a visual mark. After several visits, and continued non-representational drawings, Lyn's teacher expressed concern. I recorded her statement in my observational field notes. Cindy said, "I'm really surprised Lyn isn't drawing representationally. She does regularly for me" (informal conversation, 3.4.14). Taken aback by the statement I investigated the issue further and sat down with Lyn's classroom sketchbook. Each child in the Discoverer classroom has a thin spiral notebook and uses it on weekly basis for free drawing. As I flipped through the pages I discovered a wide collection of representational drawings of objects, places, and people. Figure 9 illustrates one of Lyn's tablet drawings

early on in this research, whereas Figure 10 documents one of her sketchbook renderings created just a few weeks prior to the beginning of phase one.

Figure 9. Lyn's Drawing of a Castle (created 3.4.14)

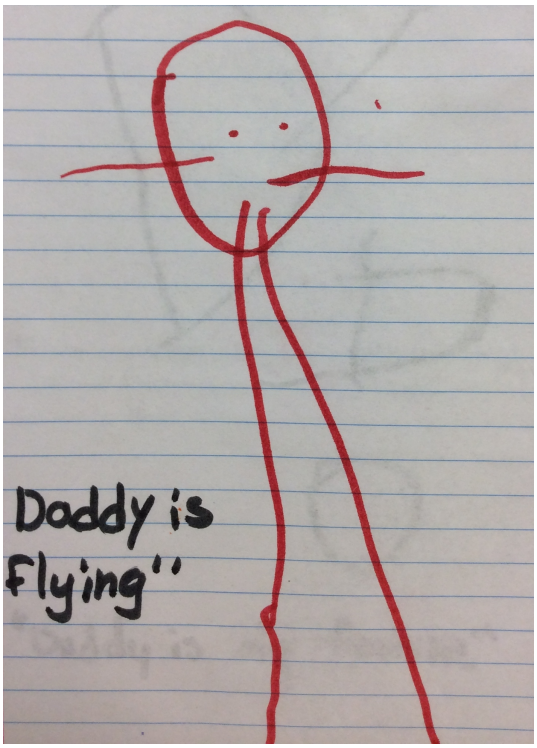

Figure 10. Lyn's Drawing of her Daddy Flying (created 2.3.14)

While Lyn's rendering of a castle looks like a scribble, her description of the drawing is sophisticated. She said, "I'm going to draw a castle. A princess is inside. That's the rain. It's green grass. That's the wind" (phase one transcript, 3.4.14) and she shared each of these details as they came alive on the screen. The clear annunciation of her ideas and full sentences communicate that she is associating her drawings with the real world and beginning to create visual symbols. Yet, there is an obvious disconnect between what she was creating on the tablet and what she was capable of with paper and markers. I watched children like Lyn closely during my following visits to the center. Some, like Lyn, continued to work in a scribbling modality on the tablet, yet I and the classroom educators knew they were capable of representational rendering. Following, I share several more of Lyn's drawings created on the tablet illustrating her consistent scribbling modality while working digitally.

Figure 11. Lyn's Drawings of a Castle (created 4.8.14) and Cinderella (created 4.15.14)

There were other children, like Lyn, who created scribbles on the tablet, yet seemed capable of representational renderings with traditional materials like paper and markers. As a point of comparison, I share two drawings created by Kevin (four years old) in Figure 12, illustrating his beginning observances of a digital disconnect to be discussed further later on. The first image is a cookie, created on the tablet computer. The second is a rainbow Kevin created in his classroom sketchbook, initiated by his teacher, Cindy. Kevin was one of several children within the study who regularly produced results of this sort. He became a participant of interest early on, and will thus be discussed further throughout this document.

Figure 12. Kevin's Drawing of a Cookie (created 3.4.14) and a Rainbow (created 2.7.13)

Children like Lyn and Kevin seemed to be between the scribbling and preschematic stages of artistic development as they are capable of representational renderings, yet often fall back into an experimental mode of working. Such a pattern continued into phase three of this research, which will be discussed later on in this

chapter. This implies that 15 weeks, which was the allotted time for this research, is a relatively short time period when considering children's artistic growth. There was not adequate time during the course of this investigation for children who began this research in a scribbling mode to move or develop to the preschematic stage. There were only a few children who displayed preschematic tendencies early on this research. Cassie's story follows.

Cassie: Representational drawing.

Cassie is four years old and newly transferred from a neighboring preschool. While absent during my observational phase, her parents were quick to file consent for this study, commenting that Cassie has a love for everything art related. During my first encounter with Cassie I confirmed that not only does she enjoy drawing, but she is also capable of creating detailed representational drawings. I share one of her first drawings, depicting a person.

Figure 13. Cassie's Drawing of a Person (created 3.5.14)

While Cassie drew this image she said, “I just want to color. This is a letter. This is a pretend letter. It’s a letter person! The green part is the lasso. It’s a cowgirl” (phase one transcript, 3.5.14). Such a rendering, representational in nature, and the accompanying detailed description aligns Cassie with the preschematic stage of artistic development. Cassie continued to work in a representational modality, as evidenced in the following images, as did several of her peers during the lifespan of this study.

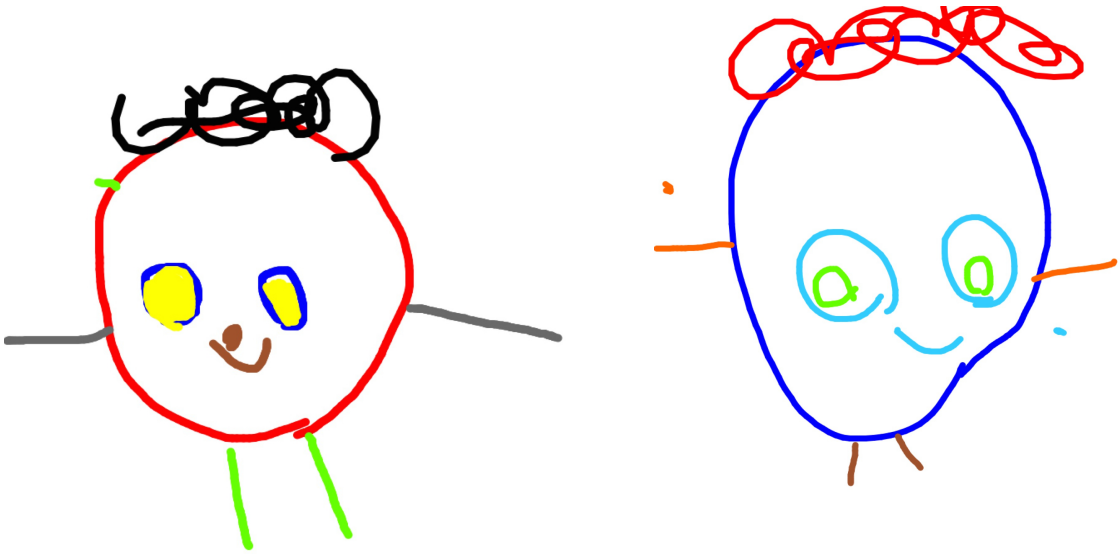

Figure 14. Cassie’s Drawings of People (created 3.26.14 and 4.2.14)

Overall, I found Cassie’s drawings to be comparable to most of the children in the Investigator classroom who regularly created recognizable objects, places, and people during tablet time. This included Gavin (five years old) and Taylor (five years old), whose drawings appear below. Gavin’s drawing of a Princess (see Figure 15), and Taylor’s drawing of a house (see Figure 16) illustrate recognizable images similar to other children in their age group. It seemed that the older the children the more likely they were to draw representationally during phase one and beyond.

Figure 15. Gavin's Princess (created 3.26.14)

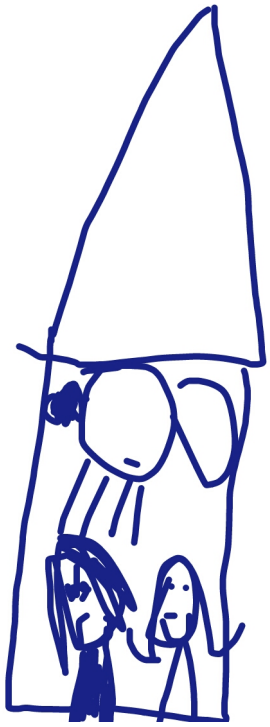

Figure 16. Taylor's House (created 2.26.14)

In addition to observing evidence of children's artistic development and the broad abilities of those participating in this study, phase one afforded me time to consider patterns in children's subject matter. In addition to their homes, families, and friends, children drew subjects that they enjoyed, namely cultural influences. I discuss such patterns in subject matter briefly below, with the story of Jason.

Jason: Patterns in subject matter.

Jason is a three-year-old in Cindy's classroom and best friends with Jon who is four years old. The two boys love super heroes. Superman®, Spiderman®, Batman®, the Hulk®, and Iron Man® are the main characters in their daily conversations. They share a set of plastic toys that represent these caped crusaders and they buzz around the Discoverer classroom fighting crime and bad guys. Compared to his friend, Jason is much quieter when he plays bad guys versus good guys, especially around new adults, and it took Jason time to acclimate to my presence in the room. At first he was quite shy and sometimes hesitant when called to the tablet table. When he saw Jon draw on the tablet willfully though Jason was quick to follow suit.

The characters with whom Jason gravitates during open play time also made an appearance during tablet time. Below I share one of Jason's first drawings during phase one, which he described as Batman®.

Figure 17. Jason's Drawing of Batman® (created 2.25.14)

Jason's drawing illustrates the beginning stages of preschematic mark making. There is a round head and several appendages. While these stick-like appendages do not line up in a representational manner, their presence suggests that Jason is thinking about legs and arms. His verbalization during the drawing process also alludes to his sophisticated thinking regarding symbolism. Jason was detailed in his description of Batman® in this image.

> This is Batman®. He is a superhero. There is his head and his mouth and his eyes. But his outfit is blue. Can we change the color to blue? There, his cape is blue and his utility belt is blue. He has all sorts of tools on his utility belt. See it there. (phase one transcript, 2.25.14)

Popular culture influences, like Batman®, were regularly observed throughout phase one of this research and beyond, as children readily integrated fantasy into their renderings (Hurwitz & Day, 2007). Such figures and subject matter were often associated with cartoons and movies children gravitate towards. The field of art education, and specifically, the study of visual culture, speaks to the power of popular culture influences upon children's experiences. According to those in the field, "popular culture is a real, authentic, and influential part of students' lives" (Cummings, 2007, p. 11). As a result,

> When children are given the choice of what they will draw, the full range of influences shaping their knowledge of the world materializes on the drawing paper, as images supplied by commercial culture vie for space with the traditional subjects of child art. (Thompson, 2003, p. 135)

It was not surprising then when children illustrated their favorite characters on a regular basis. Such renderings helped me better understand my young participants and their interests. It also further documented "idiosyncratic developmental trajectories" (Thompson, 2003, p. 135) in children, including their understanding and appropriation of imagery as well as their ability to symbolize such figures in a two-dimensional form. Below I share other drawings created by children of Batman® and similar super heroes.

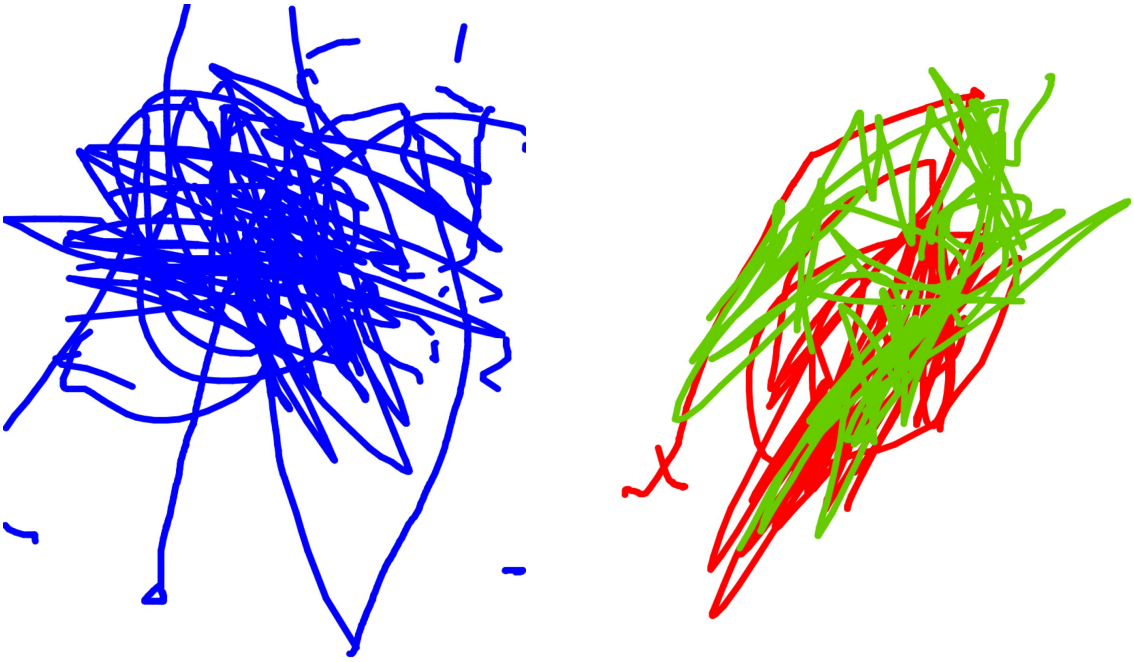

Figure 18. Batman® (created 3.4.14) and Iron Man® (created 3.11.14)

Figure 19. Jacob's Batmobile (created 3.5.14)

Subjects like super heroes were common among male participants in this study. This is not unusual though, as children often respond to previously experienced graphic sources, in this case from popular culture, and particularly from cartoons and comics (Wilson & Wilson, 1977).

While there were some girls in the study who made drawings depicting super heroes, female participants were more likely to render popular culture figures like Minnie Mouse®, Mickey Mouse®, and Disney® princesses. Following I share two examples. Figure 20 illustrates a drawing Cassie (four years old) made of Minnie and Mickey Mouse®, and Figure 21 documents another child, Carrie's (four years old) rendering of a Disney® Princess, specifically Cinderella®.

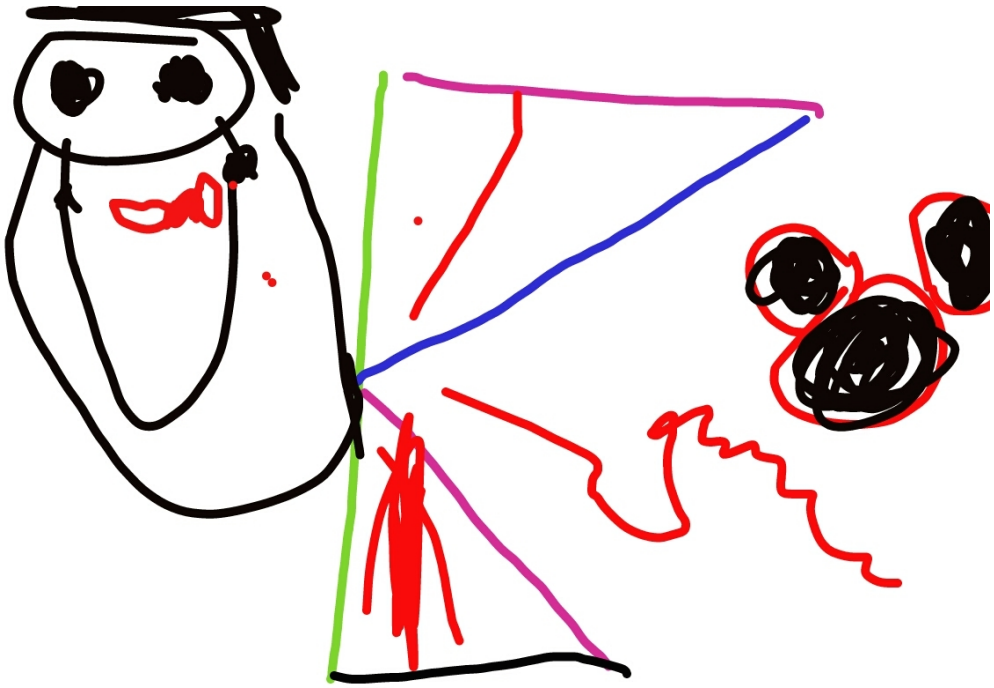

Figure 20. Cassie's Drawing of Minnie® and Mickey Mouse® (created 2.26.14)

Figure 21. Carrie's Drawing of a Princess (created 3.12.14)

Such subject matter, particularly among female child participants speaks to another area of visual culture research, which focuses on images associated with girlhood (Ivashkevich, 2009). Drawings created by Cassie, Carrie, and others participating in the study suggest that iconic and mass-produced female characters play a significant role in how young girls consume and internalize female roles. While not the focus of this particular study such visual culture influences remain critical when considering and observing children's open exploration during drawing and creation, as such observations lend themselves to indicating significant social and cultural perspectives among growing children (Ivashkevich, 2009).

In addition to popular culture influences, the subject matter children illustrated included their homes, important people, and everyday experiences. For many children

involved in this study "drawing was a way to document newly discovered pleasures and to celebrate time spent with family and friends" (Thompson, 2003, p. 136). In this way, children's digital drawings provided a sense of what participants in this study "notice, value, and understand" (Thompson, 2003, p. 136) on a regular basis, further helping me understand their unique lives as a participant observer. Carrie (four years old), while also creating drawings of princess characters, regularly documented the important people, places, and events in her life, as shown in Figure 22.

Figure 22. Carrie's Drawings of Her Family (created 2.26.14)

Observing patterns in children's drawings served two purposes. One, it afforded valuable insight into the interests of those children involved, shedding light upon their home lives and common attractions. These observations also helped document children's stages of symbolic understanding, a critical element when understanding artistic growth. While it was not my intent to "render psychological interpretations of particular children by analyzing their art products" (Hurwitz & Day, 2007, p. 45) I was able to decipher patterns in children's subject matter, which allude to advancing abilities to represent

experiences and encounters in a two-dimensional form. Such patterns represented specific symbols, which, in the minds of children, represented "a precise statement of a fact or an event in experience" (p. 50). Hurwitz and Day (2007) imply that observance of this sort of activity among young children is a sign that the symbol-making stage of artistic development is soon to follow. This also points to the continued importance of addressing popular culture in the classroom, as children are naturally motivated to illustrate the visual imagery they encounter on a regular basis (Cummings, 2007). Particularly important, keeping in the mind the goals of this research, is the means to which children encounter popular culture influences, as such information is "now liberally supplemented and frequently supplanted, by mediated messages supplied by TV, videos, electronic games, the Internet and so on" (Thompson, 2003, p. 139). Today's tablet computer serves as one such supplement which not only offers applications which supply such imagery, but also avenues for children to speak back to such visual culture influences. This research provided such an avenue in that children were freely allowed to draw and represent such images in their own digital renderings.

These noted patterns in art making also served as evidence of observational learning, as many children heard about or viewed peer's drawings, and quickly followed suit with their own renditions of super heroes, Disney® characters, or other lived experiences. Such an act, children learning from and being inspired by other children, is quite common in a school setting as students regularly engage in a variety of classroom activities in close proximity with one another. Observational learning and the drawing process has been discussed for some time, as children are often documented to borrow from drawings created by peers, siblings, adults, and other media (Wilson & Wilson,

1977). Perhaps another result of observational learning involves children's perceptions of the tablet as a drawing tool. In the following pages I share another key observation from phase one of my research regarding children's and educators' perceived opinions of the presented technology.

Perceptions of the technology.

In addition to observing children's artistic development and patterns in subject matter I noted differing opinions regarding the tablet as a tool during phase one of data collection. When introducing the tablet I found that many children were surprised when I encouraged them to draw on it using the Picasso® application. Evidence of this surprise was observed in children's body language when I would describe my research intentions and also in their statements regarding the tablet. When I asked children if they wanted to draw on the tablet they would often look confused or shrug their shoulders. This physical reaction was then followed by an oral response. Children regularly used words associated with gaming and video streaming when describing the tablet and its functions. Examples included "can I play that," "I played that with you last week," "can I play that after Angela," "when is it my turn to play on the tablet," "can I watch that," "what are we going to watch today," and "do you have any videos on this?" Even when I used art related words like drawing, painting, or sketching to describe our time together children persisted in their description of the tool. I hypothesized that this perception of the tablet was derived from prior experiences with the technology, so I probed further. While students made their digital drawings during phase one I asked casual questions to gain an understanding of children's prior experiences. Such questions included:

1. Have you used a tablet before?
2. What do you use the tablet for?
3. Do you draw on the tablet?

Answers to these questions shed light upon how tablet perceptions may have been formed among children. One of the most vocal children in this regard was Nolan (four years old). He was a student in the Creator classroom and regularly talked about the tablet as a gaming and video system rather than a drawing tool. His story follows.

Nolan: The tablet as gaming tool.

Nolan is an outgoing and curious four-year-old who loves monster trucks and the planet Saturn. Nolan was always very eager to see me and was one of the first to ask for his turn with the technology. During his drawing sessions Nolan typically drew his favorite subjects. Monster trucks of all shapes and sizes would appear on the screen, as well as Saturn and its many rings. While he drew Nolan told me stories. These stories were not only about his immediate subject matter, but other topics important to him. He spoke about his brother, a student in the Discoverer classroom, recent vacations, and his spring allergies. Nolan also told me about the other ways he used his family's tablet on a regular basis, which included everything but drawing.

I recall the first session I had with Nolan when he told me, "I have my own iPad® at home. Sometimes I play music. I do all kinds of stuff. I don't draw, but it does have pictures and you push everything, but I don't draw" (phase one transcript, 2.26.14). I was taken aback by this comment, mostly because I had heard similar statements from other children during sessions prior. The children participating genuinely seemed surprised to

be using the tablet as an artistic tool. Sam (four years old), a student in the Investigator classroom, had similar sentiments:

> I have an iPad® like this. It has games on it. Sometimes my brother and I play games. We play games but we just pick them and then we don't know what they are. We don't draw. And I've never saw an eraser like this before. This is flat. (phase one transcript, 3.5.14)

While these initial statements were earmarked during phase one of my research they continued to surface for the remainder of the research period. I documented such comments regularly in order to achieve saturation and to ensure that such an observation was significant to this research. Even at the conclusion of my research, after spending several weeks engaging young people in drawing with the tablet, children still found it difficult to associate the technology with art making. Case in point one of Nolan's later statements to me regarding the tablet:

> I have lots of other games to do. And I learn my letters and I type on there and I do all kinds of stuff. My iPad® isn't for drawing. I don't draw on the iPad®. That's how it works. They didn't make a drawing iPad®, just a game iPad®. So I can just do different kinds of games on there for kids. Typing. All kinds of other stuff. (phase three transcript, 4.23.14)

Children, like Nolan and Sam, regularly associated the tablet with games. They eagerly told me about their favorite games to play, some involving animals, others involving visual culture influences. All seemed to be educational in nature and encouraged some combination of adding, spelling, or pattern making. Children's enthusiasm for playing games on the tablet sometimes interfered with my research intentions. Some children

routinely asked what other games I had on my tablet, and, at times exited out of the Picasso® application to see what other things they could "play."

In addition to a gaming device, children also considered the tablet a video streaming tool. With easy access to the Internet, YouTube®, and other video applications, children regularly asked questions like "what are we going to watch today," "can we watch a video," and "can I show you a video I watched?" It was no surprise then to hear Nolan's perceptions regarding the tablet as a video tool. Nolan told me once, "I have my own iPad® at home. I watch different kinds of videos. Yeah. Well it's actually a video iPad®" (phase three transcript, 4.23.14). Such statements regarding the tablet as a gaming and video streaming tool were common among participants and it may be interpreted that children in this study, ages three through five, struggle to accept the multiple uses of a tablet computer. To provide an example of such a mode of thinking, I relate the subject at hand to traditional drawing materials. Children participating in this study had no problem associating crayons with drawing, however the tablet only seemed to be regarded as something to play and watch.

The question then, is why does such a perception persist, even after weeks of demonstrated use of the tablet as a drawing tool? I practiced my observational skills during each visit to learn more and I looked to the educator participants for clues. During phase one alone I documented nine statements among educators implying that adults, as well as children, consider the tablet as a gaming tool. Statements like, "you are going to play on the tablet with Sarah," "it is your turn to play on the tablet," and questions, such as, "are you excited to play on the tablet today" were recorded in my observational field notes. It is possible that such statements and questions posed by educators further support

children's perceptions of the tablet as anything but a drawing tool. In this way, observational learning in which children learn from the verbal statements of adults may influence children's thoughts and opinions regarding the technology.

While children and educators alike seemed to perceive the tablet as a gaming tool and sometimes a video streaming tool, one child stood alone in his interpretation of the technology. Gavin, unlike Nolan and other children in the center, maintained an appreciation for the many capabilities of the tablet, including its artistic abilities. One among 30 child participants, Gavin (five years old) was unique in his interpretations. As the son of an art teacher I postulate that this was the main reason for his divergent thinking. I learned that when Gavin was initially introduced to an iPad® at home the first application he experienced was a drawing tool. When I reported to Gavin that many of his peers did not typically draw on the tablet computer he surprisingly retorted, "why? Well I do! I do" (phase one transcript, 3.5.14). Perhaps with time and modeling from educators, like Gavin's parents, children will begin to see the tablet as more than a gaming and video streaming tool. Additional research, perhaps longitudinally, would shed light on how children's perceptions of the technology may evolve over time.

Other results from phase one shed light upon the benefits of the tablet computer as a drawing tool, as well as its limitations as a technology. In the following pages I share insights regarding the technical strengths and weaknesses of the tablet and the Picasso® application.

Benefits of the technology.

When introducing the tablet computer in the preschool setting it quickly became evident that there are benefits to using such a tool with this age group. Since the children involved in this study were not regularly exposed to technologies like the iPad® tablet in the classroom setting introducing the tool in an academic environment proved motivating. Children were typically eager to work with the tablet, and only on a few occasions, did I have to encourage participation. In addition to serving as an exciting tool, the tablet was user-friendly and offered capabilities traditional art media, like paper and crayons, could not, including the ability to easily erase previous markings. In the following pages I share two stories. These stories illustrate just how simple the tablet was to operate and how children responded to the enhanced artistic experience brought by the tablet and the Picasso® application used.

Cara: Ease of use.

Cara is a three-year-old student in Cindy's classroom. She comes to the center later than many of her peers, arriving shortly after 10:00 AM. Escorted by her mother, saying goodbye always seems to be a struggle. Cara cries for a while and holds on tightly to her mother's neck. It takes her mother several minutes to pry her young daughter's arms from around her and lower Cara onto the classroom floor. Once she can engage Cara in some sort of play activity with a peer she sneaks away and exits the center. Sometimes this transition moves along smoothly. Other times, Cara quickly realizes the absence of her loved one and falls into a tailspin of emotion. It is not unusual for Cara to respond to stressful situations in this way, crying and sometimes becoming physical with her peers. She often struggles during dynamic social interactions. It is difficult for her to

share and if a peer does something she does not approve of, she is sure to let the entire class know. During one-on-one encounters with Cara I find her to be quiet and unsure. When approaching new objects or experiences Cara seems to lack confidence in her abilities, whereas many of her peers appear eager to explore and experiment. She struggles with some academic activities like counting and her alphabet, and her speech is difficult to understand. When Cara is enjoying herself and confident in what she is doing, she smiles constantly and is very loving, giving adults and peers high-fives. She is quick to show others her work when she is proud of it.

For children like Cara I was initially worried that the tablet would serve as a stressor. I was, after all, exposing children to something new in their daily routine. Also, given Cara's challenges in communicating, I was concerned that if problems arose during her designated tablet time it might be difficult for me to understand her concerns. When the time came for Cara's first introduction to the tablet I was pleasantly surprised. She immediately gravitated toward the technology and had no issue turning the device on, accessing the Picasso® application, or navigating the program. For all of these young participants using the tablet was equally intuitive. Even those who did not have access to a tablet or a touchscreen phone at home knew how to interact with the device and manipulate it to do what they wanted. Even when Cara encountered frustration with the tablet she persevered through the issue, unlike other social encounters I had previously observed in the classroom. When the Picasso® application froze at one point during her session, Cara looked at me concerned, pressed a few other buttons to see if there was a quick fix, and when nothing happened, calmly pushed the device in my direction. Even when it took me a few moments to find a solution Cara sat and watched patiently.

The tablet's easy and approachable interface proved appealing to other children in the center who exhibited similar social struggles. I think fondly of Jeremy (three years old) in the Creator classroom. As the youngest child in this classroom, Jeremy is also one of the most challenging. He is often accompanied by a classroom aide and is sometimes isolated from his peers, particularly when he exhibits significant anger and frustration. It was because of these behaviors that I saw Jeremy very little during the course of my study, as he was often isolated from the normal classroom environment. Compared to his peers Jeremy produced about half the number of drawings on the tablet during phase one. Despite his minimal participation I had one encounter with Jeremy that left me asking, what other power does the tablet computer hold? I was just finishing up my visit with the Creators when Jeremy was returning from time with an aide. Without a word he sat down at the tablet table, turned on the device, navigated to the Picasso® application, and began scribbling on the screen. The aide and the classroom teachers immediately ran over to see what he was up to. I quietly told them that he could continue to work if they approved. Like Cara, Jeremy speaks very little. Also like Cara, Jeremy was calm, quiet, and engaged while working on the tablet.

The tablet is extremely easy to use even for the youngest of children. For children like Cara and Jeremy who struggle socially, and whose communication skills do not compare to their peers, it requires little guidance before they can operate basic systems with a tablet. In this way ease of use is considered a benefit of the tablet computer. Another benefit of using the tablet, and the Picasso® application specifically, involves the unique drawing options available, particularly how easy it is to erase markings on the

tablet as compared to traditional media readily accessible in classrooms. I share Jake's tale and describe the moment he noted the power of the mighty eraser.

Jake: Drawing options.

As one of the oldest students in the Creator classroom Jake (four years old) is well developed cognitively, socially, and artistically. He is a bright young boy who is curious about everything around him. He asks informed decisions and is persistent when researching new concepts. He is also a natural leader among his peers. Other children in the room regularly go to him when they have a question, or to probe him for advice regarding what task should be tackled next. Jake also loves to draw and creates detailed renderings illustrating sophisticated inventions with various purposes. Reflecting upon the development of this young child it is no surprise that his statements were some of the most thought-provoking ones during my study.

I am particularly reminded of the following comment made causally as Jake finished one of his detailed invention drawings:

> I like the tablet because you can undo, like if you messed up you can undo it. Yeah, because sometimes it is really hard to make it and you have to erase it and you already did it and you already messed up but that is okay how you make it because it is your picture. Yeah, like I accidentally made a mess but it looks like a mark and it's something real. Like that is a good accident. (phase three transcript, 4.9.14)

The eraser tool and its power to remove marks was notably significant to children. When I asked children what they enjoyed about the tablet as a drawing tool many of them noted either the eraser tool specifically or, more broadly, the ability to erase. During the three

weeks of phase one alone the eraser tool was mentioned by child participants 15 times, and during almost every sitting, children used the eraser tool in some way. When children spoke about the eraser tool their sentiments echoed that of Jake. They appreciated the fact that they could "fix" their mistakes and "undo" marks that they did not like. Several children told me that this was unique to the tablet because they cannot erase crayons, markers, or paint, which are the most accessible art supplies in the center. Later, I will note the eraser tool and the concern of permanence during my discussion of the tablet's limitations. Here it is described as a benefit because of the children's comments. In their minds the eraser tool is a major benefit when creating digitally.

Limitations of the technology.

While there are many benefits to introducing a tablet computer to preschool aged children it also presents a variety of challenges. While ease of use was certainly a benefit, in some ways it was also a limitation. Several stories illustrate this. Like many children in the study Sam (four years old) was so familiar and comfortable with the technology that he was regularly distracted by the tablet's other functionalities. There was also Kevin (four years old), a practiced artist among his peers, who identified concerns while drawing with the tablet. It seemed that while the eraser tool was quite appealing to many children there were also pitfalls to drawing with a tablet. Angela (four years old) brought to light an important issue when creating art with a tablet concerning the perception of permanence. In many ways children placed less value on their digital drawings and as a result, were quick to delete or erase their creations. Finally, the issue of tool failure is illustrated with the story of Jacob (four years old). All too often either the tablet itself

would fail, or the Picasso® application would shut down unexpectedly. Such failures proved disruptive to the creation process.

Sam: Ease of use.

Both a perceived benefit and challenge of the tablet computer is its limitless capabilities. Over the course of my study it was commonplace for children to exit out of the preferred drawing application in hopes of navigating some of the other tools available on the iPad® tablet. In this way the tablet's ease of use served as a major distraction when my goal was to observe children as they drew on the tablet. Some children had difficulty focusing on the task at hand, knowing full well that other functions and modalities were simply a click away. One child who was regularly distracted by the tablet's other features was Sam.

Sam is a four-year-old in the Investigator classroom. He maintains strong social skills and enjoys spending time with each of his peers. He always seems to be in good spirits and is happy helping his teacher with daily tasks. During my observations I found Sam to be an active listener and eager learner. He excitedly participates in the activities Jennifer plans yet, when it came time to introduce the tablet and the drawing application, Sam was reticent at moments. He informed me that he does not enjoy drawing and often exhibits difficulty in choosing a subject matter to draw.

A week or so into phase one Sam discovered the PicsIn Kaleidoscope® application on the iPad® tablet. This tool allows the user to make colorful radial designs with the flick of a finger. Sam discovered this application after he accidentally exited out of the Picasso® application and saw the other programs on the technology. Since that initial encounter Sam was enamored with PicsIn Kaleidoscope®. During each visit Sam

immediately asked me if he could use the "other app." In response I would ask Sam if he could complete a few drawings in Picasso® before working in his preferred program. He would quickly scribble a few renderings in Picasso® and then announce, "I'm done!" before opening PicsIn Kaleidoscope®. When given time to experiment with this radial design application Sam spent significantly more time working in this program as compared to Picasso®, almost twice as much time in fact, completely focused and enamored with his creations.

Over time Sam began to demonstrate his influence over his peers. After his third encounter with PicsIn Kaleidoscope® he insisted on showing his teacher and his classmates his work. This created a domino effect in which each of the children in the Investigator classroom requested time with PicsIn Kaleidoscope® as well. Marcus (five years old) was one such child. After seeing Sam's creations with PicsIn Kaleidoscope® Marcus became quickly obsessed with the tool. Like Sam, he made efforts to barter time during my sessions with him. "I will make five drawings with this one and one drawing like Sam" (phase three transcript, 4.16.14). Statements like this became commonplace during my visits to Jennifer's classroom. Other times children would sit down at the tablet, quickly turn the iPad® on, and try to navigate to their desired application before I could correct them. Marcus and Sam became quick with their fingers in an attempt to access PicsIn Kaleidoscope®.

Other children were less overt in their quest. They asked questions such as "what other games do you have," "do you have any videos for me to watch," or "can we do something different?" Even the youngest of children involved in the study were aware that the tablet had many capabilities. Such a characteristic may present a challenge in

other classroom environments when multiple tablets are accessible. Even with an adult nearby watching one child's every move on the tablet it was difficult to encourage focused activity within one program. In this particular case I wanted to discourage use of the PicsIn Kaleidoscope® because, unlike Picasso®, it does not have a blank field for drawing. Instead the user simply moves their finger and the application creates a mass of colored lines in a radial design. While pleasurable to experience this application did not address my intended research questions. I hypothesize that in a situation where there are one or two teachers and a tablet for each child maintaining focused activity could be challenging. In this way the tablet's ease of use and multiple capabilities can be seen as limitations in an academic setting.

Kevin: Drawing options.

Another limitation to the tablet relates to the act of drawing on the technology. I discuss this concern with Kevin's tale, an energetic and bright four-year-old in the Discoverer classroom. Kevin is a born leader and is regularly seen helping his peers tackle daily tasks. While he is quick to assist he is also quick to correct. If someone breaks a classroom rule or does something out of the ordinary Kevin addresses his concern quickly. Perhaps this is why he was so curious when I, a stranger to the center, first arrived. "Who are you? What is your name? Are you going to work with us?" Kevin was full of questions and I tried to answer them quickly enough, for I barely had time to respond before another onset of questions was presented. I found Kevin's curiosity and forwardness energizing.

Kevin is a cognitively advanced student by his teacher's definition. He knows his numbers and his letters, and he is starting to spell complex words. While Kevin

demonstrates great interest in his academic pursuits, he is also very curious in regards to the tablet, and art making in general. He welcomed me each time I visited the Discoverer classroom and patiently waited his turn with the technology. When called upon he eagerly ran up to me at the tablet table. What I found curious about several of Kevin's sessions during phase one was his identification of shortcomings, specifically when it came to drawing with the Picasso® application. Like several other children involved in the study, Kevin quickly noted the absence of pink and purple in the Picasso® application. The colors available include black, grey, red, dark blue, light blue, dark green, light green, brown, orange, and yellow. While for a majority of children this limited color palette proved sufficient, for others it was not. Nine children made comments regarding the lack of purple or pink specifically. While such a limitation is specific to Picasso®, as other drawing tools have a larger assortment of colors, it also alludes to a larger limitation, that concerning the ability to mix colors digitally within the application.

Soon after Kevin realized that purple was not available in the Picasso® palette he announced that he would "mix colors to make purple, because I know what makes purple…blue and red" (phase one transcript, 2.25.14). He began by selecting red and made a mark on the screen. When he chose blue and went over his previous mark with his finger he failed to create purple, instead, simply covering his original line. Kevin paused for a moment, confused. When he looked up at me he said, "I don't know why that didn't work. Let me show you again" (phase one transcript, 2.25.14). He then ran over to a painting easel in the classroom and followed the same steps with a real paintbrush and real tempera paint. Kevin demonstrated that he was able to identify the

tactile differences between digital arts and traditional materials. With this, he also identified one major difference in the way users can manipulate digital versus traditional paint. This is perceived as a limitation of the tablet as an artmaking tool, only if the tablet and, specifically, the Picasso® application is the single media accessible to create. As such, the tablet would not be the choice for media if the goal is for children to understand complex processes like mixing paint color.

Angela: Permanence.

Another major difference between digital works of art and traditionally made creations involves the perception of permanence. Through this study I have found that in a child's eyes, materials like paint, markers, and crayons are permanent, unable to be erased, whereas marks on a tablet can be erased and re-done at the whim of the artist. In the section detailing benefits of the tablet the ability to erase was noted as a major benefit among child participants. Children genuinely appreciate the fact that they can remove previous marks while working on the tablet. From the researcher's perspective, however, this capability is a major drawback, as early in phase one evidence showed that children saw their digital drawings in a different light.

In the beginning children were quick to erase their digital drawings in order to create a new composition. In fact, there were numerous works of art that went undocumented because they were swiftly erased by young participants. Even when I explained to children that I wanted to save their digital works of art and archive their progress over time this concept seemed of little concern to them. Perhaps it was because they did not possess a physical copy of their work as evidence. Perhaps it was because they saw their time working on the tablet as play time as opposed to serious art making

time. Or, perhaps, they did not understand the process of saving a piece of work for later viewership. Whatever the reason, children were not as eager to save their digital work as I was. Angela (four years old) was one child who particularly challenged me about this.

Angela loved her time with tablet and would often argue when her session was up. After a candid conversation with her teacher, Cindy, I learned that Angela was one of the few children in the study who did not have access to a tablet at home. Perhaps this explained why this particular four-year-old was so attached to me during my weekly visits. Angela, early on, was identified as a technology aficionado. In addition to representing the technology enthusiasts in the study, Angela regularly illustrated my concern regarding permanence. Of the many digital drawings Angela produced about one third of them went unaccounted for because she prematurely erased them. For Angela, the digital image seemed to be more about experience and less about producing an identifiable and collectable artifact. I recall one of my encounters with Angela, in which she shared her young, yet wise perspective. After erasing a lively drawing of her family Angela told me, “but why keep it there. I can’t take it home. I can do it again and again” (phase one transcript, 2.25.14). Similar encounters with other child participants were wide spread throughout phase one of research. While children seemed to become accustomed to saving their work over time, this was likely due to my regular reminders. In total 15 drawings from phase one went undocumented because they were erased by children. As such the issue of permanence is suggested as a limitation of the tablet.

Jacob: Tool failure.

A final limitation of the tablet, identified during phase one of research, is in regard to tool failure. Tool failure is defined as any moment in which the tablet or the Picasso® application stopped working under normal circumstances. Such an issue presented itself on several occasions during the course of research. During phase one the iPad® tablet froze or unexpectedly shut down five times. To resolve this problem I would restart the tablet. Other times the Picasso® application froze or unexpectedly shut down. This happened ten times, and to resolve this issue, I simply restarted the Picasso® program. While highly distressing to me, the researcher, I was surprised by how children responded when tool failure occurred. I am reminded of one encounter specifically, that of Jacob (four years old).

Jacob is one of the youngest children in the Investigator classroom. He sometimes struggles during social interactions, and has difficulty sharing with his peers. As a result, Jacob often plays alone in the room. It was no surprise then that Jacob genuinely enjoyed his one-on-one time with the tablet. During his third sitting with the tablet, when he was in the middle of drawing a radial design, the Picasso® application froze. His drawing was completely stagnant, and while he attempted to manipulate it further, he could not create new marks or erase previous ones. After realizing the dilemma I described the problem to Jacob. I told him that I would need to restart the program and that he might have to begin his design anew. He seemed completely unalarmed by this. He told me “okay” and pushed the tablet my direction. I was completely taken aback by his response.

In many cases children displayed similar patience and understanding when tool failure occurred, which may serve as evidence that such technologies can encourage such

attributes. Yet, it remains a challenge from my researcher perspective. As a teacher I know that tool failure can present a multitude of classroom issues, depending upon the severity of the issue. Tool failure may prevent certain lessons from taking place. Tool failure may deter student progress if it occurs regularly. Tool failure may make it difficult to document student outcomes. In this research tool failure led to the loss of data, 15 drawings during phase one. This issue is thus considered a limitation of the technology.

Phase Two Data Collection

During phase two of data collection I continued to visit each classroom once a week for between one to two hours. The primary difference between phase one and phase two was the introduction of collaborative work time. During phase two I asked children to draw in pairs and to create works of digital art together. During the first week of this phase children were paired with educators' suggestions in mind. During the second week of collaborative work I invited children to choose their own partners. During the third week I chose pairings based upon unique and interesting cases I hoped to investigate further.

Social power of the tablet.

During the course of phase two children responded to their pairings in dynamic ways. Some seemed to appreciate the additional time to work with a peer and some disliked the experience entirely. During phase two I found the tablet enhanced social experiences when pairings included children who exhibited prosocial behaviors. I also found that the tablet impeded social opportunities when pairings lead to antisocial behaviors. With these observations, several suggestions come to mind. First, when

children have developed prosocial behaviors, and are practiced in working with others, the tablet is a strong tool for potential collaboration. If, however, children struggle in social settings and have yet to develop prosocial behaviors the tablet computer should not be considered as a tool for potential collaboration, as it can ignite emotions and cause problems in an academic setting. In the following pages I share two stories illustrating the tablet's power to enhance and to impede social encounters. First I share Cindy and Casey's story who together navigated the tablet harmoniously. I counter this story with the discussion of Laurie and Emily who struggled to collaborate.

Cindy and Casey: Tablet as social enhancer.

Cindy and Casey are four years old and students in the Creator classroom. One might joke that these two girls are attached at the hip as they do everything together. They can be found playing dress up and dancing as Cindy hums a tune from one of Michael Jackson's earlier albums. This is soon followed by a princess tea party which Cindy and Casey host together. They do just about everything in unison. It was no surprise then that during the second week of phase two that they chose to work with one another on the tablet. The experience observed between Cindy and Casey proved to be the most successful collaboration during this phase.

Together Cindy and Casey created a whimsical rendering featuring a colorful heart, lots of flowers, and Tinker Bell®. Throughout their collaborative experience Cindy and Casey spoke out loud to me and one another as they described their creative decision-making. Figure 23 documents their work, which is one of the few representational drawings created during phase two. Such a representational rendering was uncommon during this phase as children often struggled to find a sense of combined ownership in

their work. Without this sense of ownership even children who typically drew representationally on their own would revert to scribbling while working with partners. This was not the case for Cindy and Casey who both took turns drawing on the tablet as they created recognizable shapes and figures.

Figure 23. Cindy and Casey's Collaborative Work (created 3.19.14)

Even when one of the girls sat idly, watching as their partner took a turn with the tablet, they provided critique of the work as it came to life. I share a segment from Casey and Cindy's conversation, which documents the girls' lively banter while creating.

> Casey: We would like to draw…show her what we can draw. Draw a heart with red. And let's color it.
>
> Cindy: Color it. So orangey!
>
> Casey: Okay this is what we make together. I'm going to put a blue stem here and then I'm going to do this.
>
> Cindy: It looks pretty.
>
> Casey: And then I do blue. It's going to be…
>
> Cindy: It looks like a flower! I want to know what is that.
>
> Casey: So this is me and we take some blue and spin it all over. And then some yellow. And then some red.
>
> Cindy: And how about green? How about all the rainbow colors?
>
> Casey: Let's show her what we can do. Ooo, I'm going to make Tinker Bell®.
>
> Cindy: Tinker Bell® isn't yellow! Her outfit is green.
>
> Casey: Show her…can you make her something else? Make Tinker Bell®.
>
> Cindy: I am making Tinker Bell®. I'm making her wings. This is her wing. She flies. (phase two transcript, 3.19.14)

I attribute the success of Cindy and Casey's partnership to pre-established prosocial skill sets. During my preliminary visits to the center I noted that both Cindy and Casey were prosocial children who enjoyed working with others, had no difficulty sharing objects or experiences, and showed a genuine interest in helping peers and their teachers. I also

attribute the success of this partnership to a pre-established friendship. The classroom teachers informed me early on during this phase that Cindy and Casey had been very close from the beginning of the school year, roughly five months before the beginning of this study. Because of this long-standing relationship Cindy and Casey were accustomed to one another's mannerisms and had an established way of communicating with one another.

Other children in the Creator room experienced positive, collaborative encounters. Jake (four years old) and Celeste (four years old) were another interesting pair. Figure 24 illustrates their collaborative work of art featuring an invention that made sounds and pushed people out of the way when they were in danger.

Figure 24. Jake and Celeste's Collaborative Work (created 3.19.14)

At first Jake and Celeste were not sure how to navigate the tablet together. When they realized that only one finger could make a mark at a time they quickly devised a plan. They alternated turns, each responsible for a different set of parts on the invention. Jake and Celeste demonstrated strong prosocial skillsets and seemed to genuinely understand the act of collaboration, even down to the title they chose for their work. Jake proudly announced the name of their collaboration as "friends drawing" (phase two transcript, 3.19.14). Like Cindy and Casey, Jake and Celeste regularly exhibited strong social skills. They were happy working with a variety of peers and shared easily.

Shawn (four years old) and Gabe (three years old) represented a third case of strong collaboration. Like Jake and Celeste they initially struggled to negotiate the tablet interface as a pair. Once Shawn expressed interest in drawing a construction site the frustration seemed to dissipate and was replaced with a growing excitement for the unveiling of their final composition. The drawing quickly turned into a creative jumble of haunted characters inhabiting the construction site. The boys were so invested in the drawing and in the experience that at one point during the collaboration they began to finish one another's sentences. This was evidence that they were thinking through a visual story together. I share their commentary and their collaborative drawing below.

Shawn: Let's draw a construction site.

Gabe: Awesome! See that! Octopus. There's an octopus right there! Like octopuses have lots of things. It could be a ghost one that flies out of the water. Is that the eraser? It's a haunted…

Shawn: Construction site! I'm going to make a ghost man.

Gabe: I'm going to make a ghost man too.

Shawn: Wait for me to get done. There!

Gabe: That guy is so scary!

Shawn: Okay, let's draw Frankenstein.

Gabe: Look at that!

Shawn: This is…I'm drawing a haunted castle. A ghost castle. That's like a rainbow.

Gabe: That's a rainbow ghost snake coming out.

Shawn: With brown and yellow…yellow, orange, blue, red, and silver.

Gabe: That's a witch. Yeah witches have brooms so they can fly. She's flying down like this!

Shawn: She's actually walking on a roof upside down. She's actually on a ceiling. She has…

Gabe: Suction cups on her shoes! (phase two transcript, 3.19.14)

Figure 25. Shawn and Gabe's Collaborative Work (created 3.19.14)

Shawn and Gabe's collaborative drawing was full of haunted excitement, and while unrecognizable to the adult eye became visible to the observer following their conversation and the sequence of the drawing. Such a drawing, which resembled a scribble in its final form, became typical among collaborations proving that Cindy and Casey's representational rendering was truly unique.

Many children experienced positive collaborative experiences during phase two, again, likely a result of pre-established social skills. I documented 19 strong collaborative experiences during this phase out of 47 opportunities. These were instances in which pairs shared the device equally, did not argue, and genuinely seemed to enjoy the collaborative process. Among these 19 positive experiences at least one child in each pair had prosocial skills that served to sustain an amiable collaboration. These skills were confirmed during classroom observations and supported by insights from their teachers when I shared preliminary findings during informal conversations. There were, however, some children who struggled during this phase. I share their stories next.

Laurie and Emily: Tablet as social impediment.

Laurie is an outgoing and outspoken four-year-old with braids throughout her hair and a unique fashion sense, usually consisting of purple and pink accessories. Emily is also four years old and outspoken, seen as stubborn among her peers according to her classroom teacher. She likes to be the leader in the class and is at ease telling children what they need to do on a regular basis. Cindy, their teacher, informs me that both girls often struggle during social encounters. Specifically, she noted that, "they like things to go their way and sometimes they can be forceful with others" (informal conversation,

3.25.14). It was no surprise that of all the pairings during phase two's collaborative experience Laurie and Emily's encounter was the most volatile.

Laurie and Emily approached the tablet table with the same enthusiasm I had observed in previous weeks. Both were excited to work with the tablet and display their artistic skill sets. When I informed them that they would be working together to create a collaborative work of art, sentiments quickly began to change. Moments after the first few marks were made I had to step in to calm rising emotions. When one child was forced to pause and allow the other to have a turn with the device angst quickly followed. "I don't want her to draw with me." "I want this to myself." "She can have a turn later" (phase two transcript, 3.25.14). These were the sorts of comments I heard repetitively during their session together. By the end of their tablet time Laurie and Emily had produced two collaborative pieces, which featured a series of scribbles, as they could not decide on a mutual subject matter. In this particular case there were two children known to struggle in social situations. This was observed throughout the research period and confirmed by the classroom educator through informal conversation. This helped me understand why Laurie and Emily failed to find a common stance when working with the tablet. In this situation asking children to share a device, which is limited to one mark-making finger at a time, added more stress to the experience.

Another similar encounter occurred with Carrie (four years old) and Taylor (five years old). As the only two girls in the Investigator classroom Carrie and Taylor are often found playing with one another, but they also regularly argue over toys, games, and activities. "They are both strong-willed, and so they disagree sometimes" (informal conversation, 3.26.14) Tiffany told me during one of my visits. While this pairing was

much less volatile verbally compared to Laurie and Emily's encounter I witnessed similar difficulties in collaboration. While Taylor seemed to approach the tablet with an open mind, and even suggested a subject matter that both girls were interested in, Carrie was not at all responsive to sharing the technology. When I defined collaborative drawing as an opportunity to create with a friend Carrie seemed to shut down. She frowned, crossed her arms, and put her chin on the tabletop. Taylor seemed to sense this frustration and immediately moved the tablet over to Carrie to render, exhibiting strong prosocial skills. In this case one child exhibited empathy, a strong social skill, while the second child struggled. In the end Carrie and Taylor failed to produce a truly collaborative drawing. Instead, they elected, amongst themselves, to each make their own drawing to show me. With this it may be suggested that even in pairs when one child exhibits prosocial skills, if this ability is not mutual, the tablet can still foster stressful collaborative encounters.

Out of 47 possible collaborations in phase two I observed five overtly stressful collaborative encounters. These were situations in which both children argued regularly during the drawing experience and failed in creating a collaborative rendering. An additional 14 encounters resulted in children working on their own during tablet time. These were cases in which children refused to work with a partner, or they began working with a peer and announced they wanted their own time with the tablet. Nine collaborative encounters were noted as neutral instances. While these experiences were not overtly volatile like Laurie and Emily's time together they were not pleasant. During these encounters children argued over sharing the tablet in a more civil manner. They expressed stress in less obvious ways, including shrugging, rolling of the eyes, or passively sitting while their partner drew, exhibiting boredom. Overall, data from this

study provided little evidence that the tablet enhanced prosocial skillsets in young children.

Phase Three Data Collection

During phase three of data collection I continued to visit each classroom once a week for about an hour or two, and each child had roughly ten minutes to work. During this phase children were presented with the tablet in addition to crayons and drawing paper, and were asked to choose with which media they wished to work with, the technology or the traditional materials. Children made their selections and the unselected tool was put to one side of the table. Since the unselected tool was always available some children alternated between tools. In the following pages I share my findings from phase three through a series of stories. These stories describe several children participants, their media preferences, and several unique encounters with media.

Media preference.

Over the course of phase three it became evident that some children preferred the tablet as a drawing tool and some preferred traditional media. Termed technology enthusiasts and traditional enthusiasts these participants were identified based upon the amount of time spent with their preferred tool. Some enthusiasts avoided their unselected tool entirely or used it minimally. During each sitting I recorded how much time a child spent with the tablet versus the paper and crayons. In total children spent 260 minutes working with the tablet during phase three and 259 minutes working with the paper and crayons. While such figures fail to dispute that one media choice was grossly more popular than another, individual figures allude to the existence of preference. Major

outliers included Gabe (three years old) who spent over 12 minutes working with the tablet during one session and no time with the paper and crayons, and Angela (four years old) who spent over 12 minutes with the traditional materials during one of my visits and no time with the technology. To illustrate these individual preferences further I begin with the story of Jon (four years old), technology enthusiast.

Jon: Technology enthusiast.

Jon is a four-year-old student in the Discoverer classroom. He is often absent during the morning hours as he has scheduled time with a specialist who assists him academically. He seems to genuinely enjoy this one-on-one time, as he returns to the room skipping, smiling and in an overall good mood. When called upon to work on the tablet Jon moves in double time, as he cannot get to the tablet table fast enough. During several of his sessions Jon avoided the traditional materials entirely working only with the tablet. In one session he spent seven minutes and 17 seconds working in Picasso® and no time with the crayons and paper. The following figures document his digital creations from this session, which include a portrait of his mother, a busy road, and a spider.

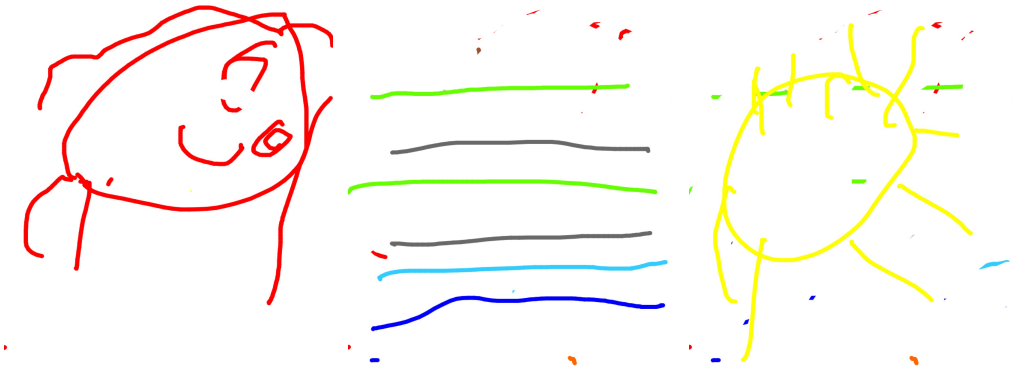

Figure 26. Jon's Tablet Drawings (created 4.8.14)

In addition to spending a majority of his time working with the technology, Jon exhibited great angst when his turn with the tablet would come to an end. “But I don’t want to go!” “I’m not done drawing on the tablet.” “I don’t want to share it with them.” These were the types of statements I heard often from Jon illustrating his sincere interest in the technology. Sixteen children exhibited similar tendencies towards the tablet. Samantha (three years old), another digital enthusiast, spent nine minutes and 23 seconds working with the tablet during the first week of phase three, and just one minute with the paper and crayons. Sam (four years old) spent nine minutes and 35 seconds working with the tablet and one minute and 52 seconds with the paper and crayons. There was Sara (four years old) who, during her second session of phase three, spent nine minutes and 56 seconds with the tablet and no time with the traditional media. Over half of the children involved in the study seemed to share such an affinity for the tablet technology. By contrast, a total of six children in the study were noted as traditional enthusiasts, or children who markedly preferred crayons and paper over the tablet. To illustrate the sentiments of this smaller population of participants I share the story of Gavin (five years old) next.

Gavin: Traditional enthusiast.

The traditional enthusiasts were those children who spent a majority of their work time, if not all, with traditional materials. I found that the older children involved in the study, or those more advanced in their artistic development, often fell into this category. One such child, who spent significantly more time working with crayons on paper, was Gavin. As described previously, Gavin was a student in the Investigator classroom and the son of an art educator. He loves to draw, as noted by Jennifer on a regular basis.

When Gavin sat down to the tablet table during the first week of phase three he expressed his sincere excitement. He said “wow! You have crayons and the tablet! So I can see what I can draw. I thought you would only have that” (phase three transcript, 4.9.14) as he pointed to the technology. He immediately picked up a crayon and began rendering. Gavin spent 21 minutes and 49 seconds creating his first drawing illustrating one of his favorite animated cartoon series, Pokemon®.

Figure 27. Gavin’s Pokemon® Drawing (created 4.9.14)

After creating this very detailed traditional rendering, Gavin decided to make a similar drawing on the tablet. The following took him three minutes and six seconds to complete. Also an image of Pokemon® this drawing is less detailed and has fewer figures featured.

Figure 28. Gavin's Pokemon® Drawing

Another child who exhibited similar tendencies during the first week of phase three was Niles (five years old). After working on the tablet for just three minutes Niles switched to the paper and crayons. He spent twice as much time rendering with the traditional materials than he did with the tablet. Niles created a drawing of a Star Wars®

inspired figure with the tablet, and made a detailed thunderstorm scene with the crayons and paper. Both drawings follow. Similar to Gavin, Niles' traditional rendering of the thunderstorm is more detailed.

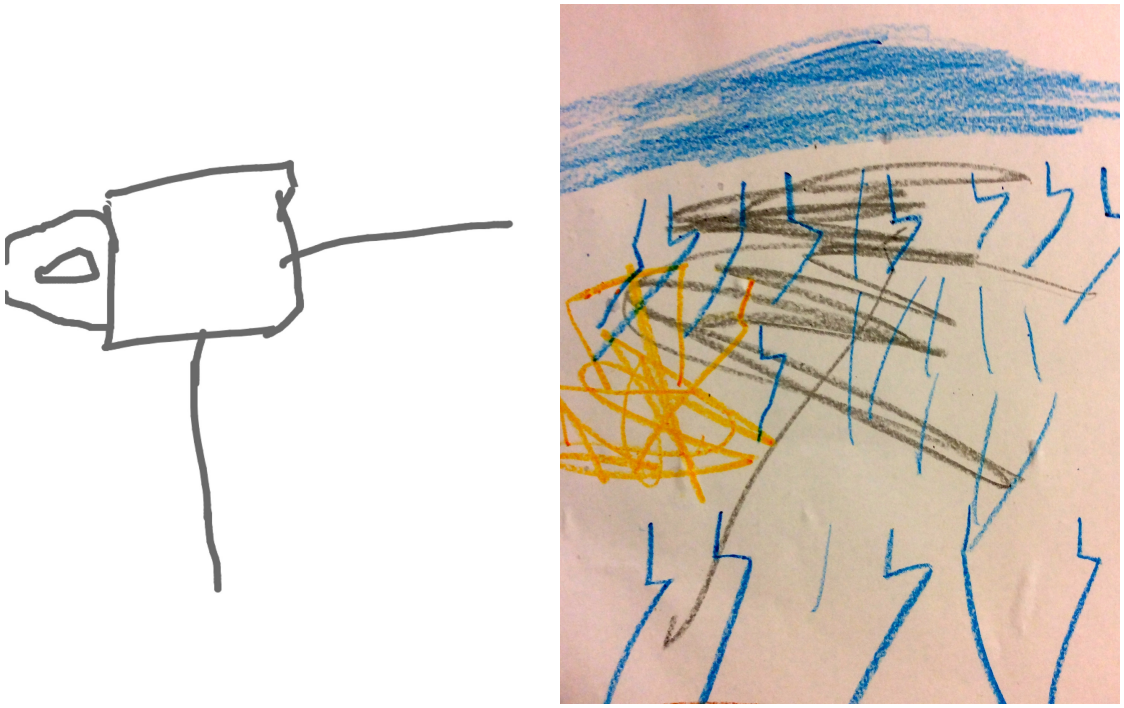

Figure 29. Nile's Drawings (created 4.9.14)

Marcus (five years old) was another child who spent more time working with the crayons and paper compared to the tablet. Marcus spent a total of 19 minutes and nine seconds working traditionally, compared to the six minutes and 32 seconds he spent drawing digitally. Marcus made two drawings with crayons. One featured a basic design with a zebra pattern. The second drawing was more imaginative, featuring colorful mountains with rainbow colored snow.

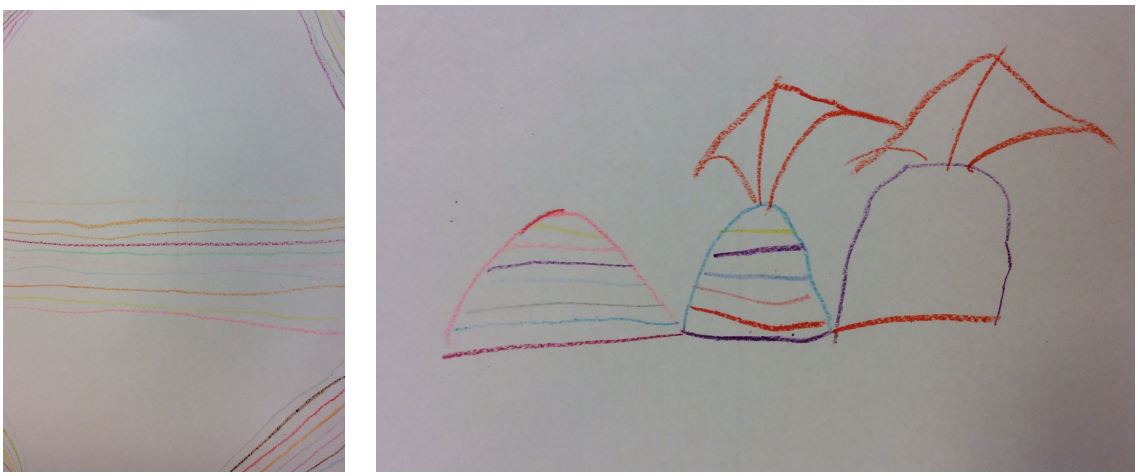

Figure 30. Marcus' Traditional Drawings (created 4.9.14)

Gavin, Niles and Marcus not only shared an interest in traditional media, but they also represented the oldest child participants in the study. Each were five years old and well into the preschematic stage of artistic development. Whether age is a significant factor with regard to media preference is still unclear and perhaps a topic for future study. Within the scope of this line of research, at least, those who were determined traditional enthusiasts were either four or five years of age. This is not to say, however, that all four and five-year-old children prefer crayons and paper over a tablet. Within this site and among these participants, older children exhibited a greater appreciation for traditional art making materials.

Peter: A love for both.

While some children exhibited clear preferences in media, others within this study showed an interest and appreciation for both tools. To illustrate this I share Peter's story who represents those participants who spent equal time with both media options.

Peter is a four-year-old student in the Discoverer classroom who smiles regularly and owns bright, curious eyes. At the same time he is one of the quietest students in the class and speaks very little. When he does speak he is difficult to understand. While he may struggle when communicating this does not seem to impact his peer relationships. Peter is well liked among his fellow classmates and has many friends.

Early on during phase three Peter became a participant of interest. While those like Jon (four years old) and Gavin (five years old) exhibited preferences in drawing tools early on Peter seemed to maintain an appreciation for both the tablet and crayons and paper. What was unique about Peter's tablet sessions was the manner in which he interacted with the tools. Peter jumped from one to the other, spending roughly the same amount of time with each. I recall one session in which Peter started with the tablet, worked for 19 seconds, then moved to the crayons and drew on paper for 28 seconds, then back to the tablet for one minute and 14 seconds, only to return to the crayons for one minute and 21 seconds. This type of back and forth action went on several more times until Peter announced that he had completed his two drawings.

Figure 31. Peter's Drawings of Iron Man® (created 4.22.14)

Another child who exhibited this type of back and forth action between technology and traditional materials was Lacey (four years old). Lacey created the following two drawings, both depicting solar systems, within a timeframe of four minutes. Equal time was spent with each media and she took turns making a mark with her finger on the tablet screen and then a mark with the crayon on paper. This back and forth activity, and equal time commitment, demonstrated Lacey's interest in both drawing tools.

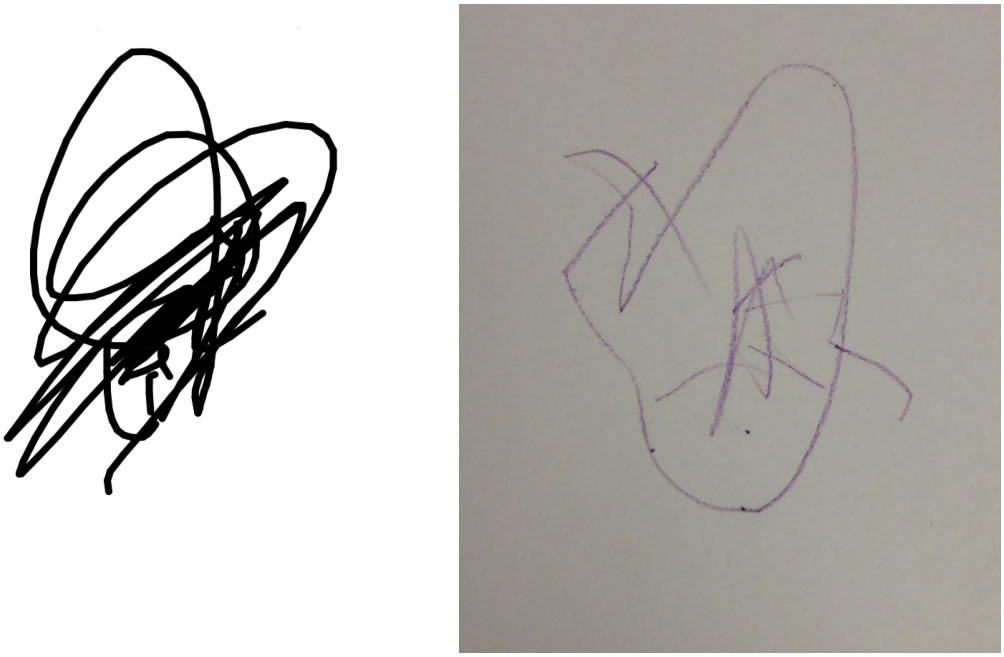

Figure 32. Lacey's Drawings of the Solar System (created 4.8.14)

Eight children involved in the study fell into the same category as Peter and Lacey, exhibiting interest in both media. While only a few others demonstrated this act of jumping from tool-to-tool all eight spent roughly equal amounts of time with the tablet as they did with the crayons and paper. Since time was a major factor in anticipating what tool children preferred for drawing it was difficult to decipher any preference among

these eight children. They seemed to genuinely enjoy both media options and utilized them equally for drawing purposes. Such results illustrate that children maintain variant levels of interest and preference in tools, specifically when drawing.

Patterns in digital art making.

In addition to identifying media preferences among children, phase three was instrumental in bringing to light two additional observations in children's digital drawings. During phase three the core category 'patterns in digital art making' achieved saturation. To achieve saturation in a qualitative study of this sort is paramount, as it ensures that data collection measures are producing consistent and recognizable patterns. The core category patterns in digital art making included the sub-categories of replication and a digital disconnect. In the following pages I share the story of Celeste (four years old) as a means of describing what I mean by replication. I also share Taylor's (five years old) story in order to illustrate the digital disconnect, which first presented itself during phase one and continued to occur during phase three of this research.

Celeste: Replication.

Celeste is a sweet and curious four-year-old in the Creator classroom. She is very social and boasts many friends among her peers. Susan and Tiffany informed me that Celeste works well with all students and is developing well academically. Perhaps what sets Celeste apart most from her classmates is her witty sense of humor. Celeste regularly tells jokes and makes silly comments in an effort to make her peers laugh.

In addition to demonstrating strong social skills Celeste routinely draws representationally. The subject matter of her work with the tablet usually involves

flowers, farmland, and animals. In addition to demonstrating a love for nature Celeste was one of several children who practiced replication during phase three. Replication is the act of overtly drawing the same subject matter, sometimes identically, on the tablet and on the paper with crayons. Below are two drawings Celeste created in one sitting both depicting ducks. The first, the digital drawing created on the tablet, was described as a "practice drawing" (phase three transcript, 4.16.14) for her final traditional rendering to the right.

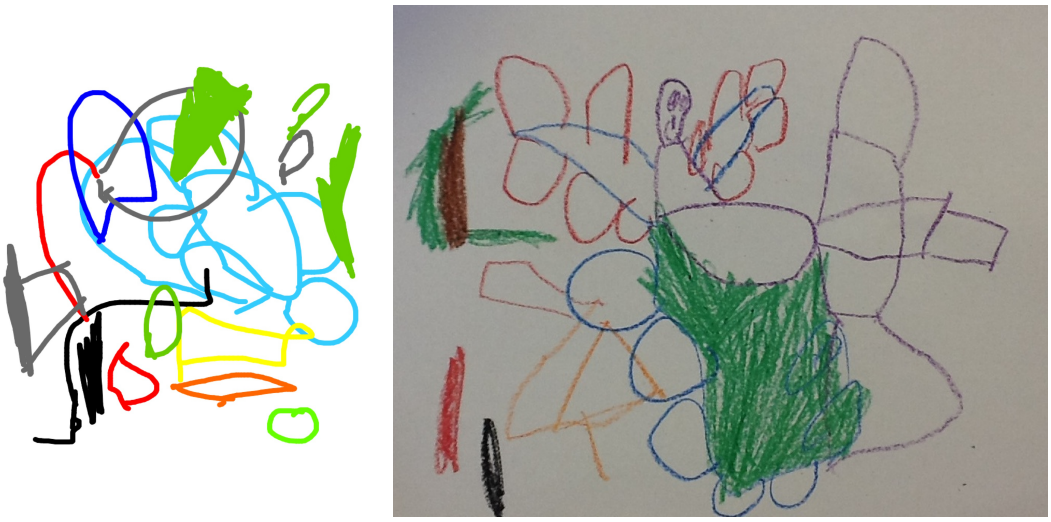

Figure 33. Celeste's Drawings of a Duck (created 4.16.14)

Other children demonstrated this act of replication during phase three. Cassie (four years old) did so several times. During one particular session Cassie began with the tablet and created a drawing of a house. When she moved on to the crayons and paper she decided to draw an identical house with more detail. While working on her digital drawing Cassie shared "I'm drawing a house. I'm drawing that house. Some little person.

He has a hat on too. And one eye! I want to color" (phase three transcript, 4.16.14).

While working with the crayons and paper, this is what Cassie had to say:

> I want to draw a…I think I'm going to draw a house. I need some…I just need a yellow door. A yellow door. And I need something…blue. I think I need blue lights. And yellow…I need a bottom. I need something orange. I think…all red. And, I think I need one dot here and one dot there and one dot here and one dot there. It's all done! (phase three transcript, 4.16.14)

One will note while looking at Cassie's two drawings illustrated in Figure 34 that the crayon and paper rendering to the right has more information. The house is shaded in more fully, and as such, took longer to complete.

Figure 34. Cassie's Drawings of a House (created 4.16.14)

On a similar occasion Cassie created the following two rainbow drawings. Again, she went to the tablet first and quickly rendered a colorful rainbow. After this, she moved to the paper and crayons, providing a more detailed drawing, and this time, including a self-portrait of herself.

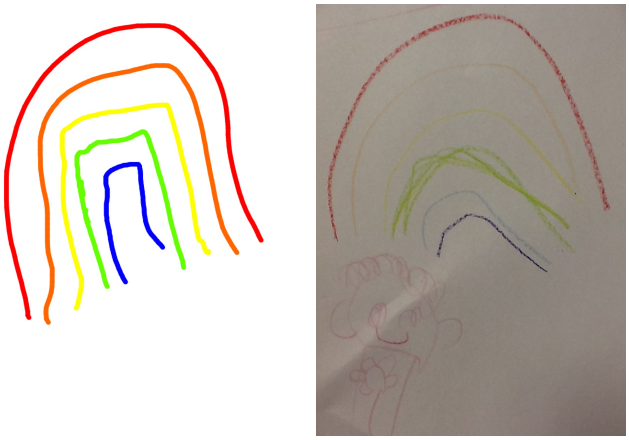

Figure 35. Cassie's Drawings of a Rainbow (created 4.23.14)

Another instance of replication was documented when observing Gavin (five years old) as he drew during phase three. In the following two drawings Gavin illustrated Elsa®, a character from a popular Disney®, film holding a flaming fire sword. When comparing the two images, one will notice a slightly different composition in the traditional rendering to the right. Here Gavin altered his visual story slightly adding additional detail and what he described as Digimon® eggs, flying through the sky.

Figure 36. Gavin's Drawings of Elsa® (4.16.14)

What was interesting about these observed instances of replication was the order in which media was selected and used. When replicating children always drew with the tablet first and then moved on to work with the crayons on paper. They also often used words like "practice" when describing their digital version, much like Celeste when drawing her duck. This implies that, for some young children, drawings with the tablet are preliminary moments of practice and exploration to be later finalized in a traditional rendering. This perhaps further supports the hypothesis that in young children's minds a traditional rendering made on paper holds more value than a digital equivalent. This could be attributed to children's greater familiarity with traditional media, or perhaps the ease with which children utilize tools like crayons on drawing paper.

Taylor: A digital disconnect.

Another notable observation during phase three of research was what I labeled a digital disconnect. Such a disconnect involved observed instances when students seemed to scribble on the tablet yet draw representationally with the paper and crayons. Such an observation initially presented itself during phase one when identifying children's stages of artistic development. At first such phenomenon was considered a state a flux between stages, in which a child seemed to be in between the scribbling stage and the preschematic stage of development. During phase three digital disconnect became a common observance among children and one that begged further investigation. One child who displayed this tendency often was Taylor (five years old).

Taylor is one of the oldest students in the Investigator classroom and, as noted previously, one of only two girls. She is several inches taller than her peers and boasts a lively fashion sense. Fashion is a personal interest of hers as she is routinely quick to

comment on any new accessory worn by an adult. There were several occasions during my visits when Taylor would compliment my earrings or a colorful scarf I wore. In addition to being stylistically savvy Taylor is quite social. She is close friends with Carrie, the other female student in Jennifer's class; however, she also plays with others. At times Taylor can be stubborn when plans do not go her way. When it came to using the tablet Taylor worked very quickly with the technology. Jennifer, her classroom teacher, interpreted this as rushing. "She needs to focus, she needs to take her time. This is what she needs to practice before going to kindergarten" (informal conversation, 4.9.14). Jennifer shared these comments after one very brief session with the tablet in which she redirected Taylor to the tablet table for additional work.

Over time this perceived hastiness with the tablet was seen more regularly among children. As students continued to become more comfortable with my weekly visits, and as tablet time became a routine in their regular schedule, some children began to spend less time working on their digital drawings. Sometimes this was because of another distracting activity going on in the normal classroom setting. Sometimes this was a result of children's moods or unusual behavior. Sometimes children simply did not seem as excited to work with the tablet. Whatever accounted for the haste, it was not unusual for children to "rush" (informal conversation with Jennifer, 4.9.14) through their tablet time. Taylor, for example, routinely created hastily drawn digital renderings with the tablet. Yet, when presented with the crayons and paper she took more time in her creation, worked representationally, and providing much more visual detail. Taylor exhibited her ability to draw representationally with the crayons and paper, yet seemed to revert to a scribbling modality when working on the tablet. Two of Taylor's drawings documented

during the same sitting, are featured in Figure 37. The image to the right was made with the tablet and the image to the left was created with crayons on paper.

Figure 37. Taylor's Drawings (created 4.16.14)

Other children exhibited this same phenomenon during phase three. When working with the crayons and paper Kevin (four years old) drew a detailed mountain scene, below and to the left. While working with the tablet he reverted to a scribbling modality, moving his pointer finger in a circular motion on the screen over and over again.

Figure 38. Kevin's Drawings (created 4.15.14)

Dillan (three years old), another child, represented a similar case of disconnect. During one particular sitting he decided to draw one of his favorite subjects, a monster truck, with both media options. Differences in detail are apparent when comparing these drawings side by side. While Dillan's digital drawing looks more like a scribble with lines covering a majority of the picture plane, his traditional drawing is more representational with big wheels and what Dillan called "decoration." Here Dillan chose to replicate the same subject matter via both artistic means, yet the output differed in appearance.

Figure 39. Dillan's Drawings of a Monster Truck (created 4.16.14)

In addition to differences in the quality of imagery produced digitally on the tablet versus traditionally with crayons on paper I also documented variations in children's backstories during phase three. Children who demonstrated a visual difference in their output also varied in their art speak while rendering. While drawing on the tablet, children's descriptions of their work were very succinct. While working with the crayons

and paper, children worked more slowly, and therefore had more time to tell me about their creations. I think of Marcus' commentary during one such session. Like his peer Taylor (five years old), Marcus (five years old) worked rapidly with the tablet and regularly produced several drawings within the span of just a few minutes. These drawings were typically popular culture references like the Power Ranger® seen below and to the right in Figure 40. While approaching the crayons and paper, however, Marcus was much more meticulous and detail oriented. His rainbow dragon airplane, below and to the left in Figure 40, includes an abundance of texture and expressive lines.

Figure 40. Marcus' Drawings (created 4.16.14)

Also notable is his commentary. While working on the tablet Marcus shared, "guess what this is. His weapon is a lava gun" (phase three transcript, 4.16.14). While working with the crayons and paper, however, Marcus was much more expressive. He shared the following:

> I catch it. It's a rainbow dragon airplane. It's mouth. Look at its mouth. It's opening for food. So he can eat something. I'm making a bug in his mouth. No, this bug tasted like pizza…bacon pizza. I had bacon pizza. I have bacon pizza. Ha! Oh yeah. It's going…look at its tongue. It's brown. Look at his tongue. It's this long. Look at his legs. He only has two legs. And look at his tongue. And you want to see what his arms are connected to? His arms are connected to his tongue. Magic arms. (phase three transcript, 4.16.14)

Such observed differences in art speak is reminiscent of how Piaget (1936) described the preoperational stage of development. During this stage "language skills virtually explode" and "rapidly increasing vocabulary provide labels for newly developed schemas and serve as symbols that enable children to think about objects and events" (Ormord, 1995, pp. 40-41) even when they are not in sight. Here it is quite evident that Marcus is capable of creating lively and dynamic schemas; however his previous, almost minimalist description of his digital work seems to represent a slight regression in the implied relationship between art making and language.

Other observances of digital disconnect during phase three were less overt. These were instances in which children drew representationally with both the crayons and the tablet, however their digital renderings proved less detailed than their traditional drawings. Gavin (five years old) routinely created incredibly shaded crayon drawings that filled the compositional frame. Yet, with his digital drawings, Gavin relied mostly on line and worked in the center of the screen, rarely showing the implication of content beyond the digital canvas. Figure 41 illustrates two renderings from one sitting with Gavin. To

the left is Gavin's traditional drawing of a forest and a thunderstorm. To the right is a self-portrait of Gavin sleeping in his home.

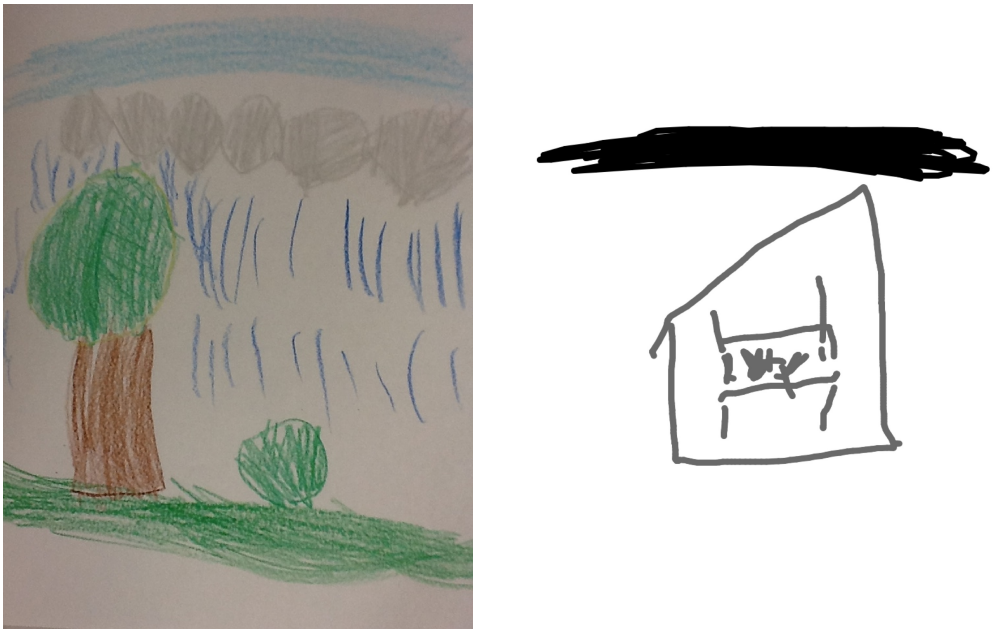

Figure 41. Gavin's Drawings (created 4.23.14)

While Taylor (five years old), Kevin (four years old), Dillan (three years old), and Marcus (five years old) provided the most overt examples of digital disconnect by distinctly drawing representationally with the traditional media and scribbling with the tablet. Gavin (five years old) represented a smaller number of children who drew representationally with both media, with slight variations in detail.

A third observance of digital disconnect, which only happened on two occasions during phase three, proved perplexing. These were instances in which children jumped from one media to another, and also seemed to jump from a representational mode of drawing to a scribbling mode, regardless of the tool in use. Jon (four years old) was the first to demonstrate this bouncing between media and modality. He began with the tablet

and drew a representational fish first. Next, he drew an octopus, however unrecognizable to the adult eye. From the octopus, Jon drew a representational rainbow. Finally, Jon ended with the crayons and paper, in which he scribbled what he described as a map. Jon's images are featured in Figure 42.

Figure 42. Jon's Drawings (created 4.22.14)

Laurie (four years old), like Jon, was another child who jumped from media-to-media and displayed varied artistic abilities. During phase three Laurie often began with the paper and crayons as opposed to the tablet. This in itself was interesting, as all other participants chose to work with the tablet first during this phase. During one sitting Laurie produced the following four renderings. Her crayon composition featured a representational drawing of a princess. When she moved over to the tablet she seemed to revert into a scribbling modality. After this moment of frenzied mark making Laurie moved back into a representational style of rendering with the technology. She drew me and a monster. Laurie's images are featured in Figure 43.

Figure 43. Laurie's Drawings (created 4.22.14)

It is difficult to say why children like Jon and Laurie moved back and forth between modalities, as there was no clear correlation between mode and media. One hypothesis is that scribbles represent a brief moment in the young child's mind in which they require kinesthetic release and revert back to an earlier stage of artistic development, moving their finger or crayon back and forth rapidly on the accompanying ground. In order to probe this topic further additional research could be conducted with children who exhibit similar patterns. Among this particular sample, only two, of the 30 consistent child participants demonstrated this sort of phenomenon.

Phase Four Data Collection

During phase four of data collection I interviewed child participants and conducted three focus group discussions to continue to explore children's perceptions of the tablet tool. I concluded this phase with three individual interviews with the classroom educators. In this section I discuss each of these data collections measures, the protocols I used, and the modifications I made to my protocols while in the field. This is followed by my results from phase four, which were used for triangulation purposes to confirm phase one through three findings.

In preparation for one-on-one interviews with children I culled artwork from each child and printed color copies on cardstock paper. I had two reasons for doing this. First, I wanted to have a hardcopy reference for each child to view while they reflected upon their experience with the tablet. Second, I wanted each child to have a tangible memento of our experience together in addition to the CD they received housing all of their drawings and a commemorative video.

During implementation of interviews I realized that modifications to my approach were necessary in order to gather meaningful insights. After conducting the first interviews with children several concerns presented themselves. For one, children struggled with the fact that I wanted to speak to them about their experiences instead of draw with the technology. I heard questions like, "where is the iPad®," "aren't we going to draw today," and "where are your paper and crayons?" Even after I explained to children that I wanted to ask them important questions about their time with the tablet they seemed dissatisfied. "Can we draw after that?" "Can I play with the tablet after your questions?" Questions of this sort immediately followed and I found myself bartering with my young participants. "Sure, after we have our interview, you can draw an image if you like." As a result of my participants' eagerness to work with the technology the interview data I pulled from week one seemed minimal. In addition to this I found that participants struggled with some of the questions I posed. One such question read as follows: "what did you enjoy most about using the tablet computer to make drawings?" Most children were confused by this question, and instead of reflecting upon their overall experience with the technology, answers were usually in the form of "Batman®" or "Disney® princesses." I modified this question slightly and asked "what do you like

about the tablet?" This seemed more attainable for children who began to respond with answers such as "working with you," "working with my friend," or "being able to erase my mess-ups."

Another question which children had difficulty responding to was in reference to the hardcopy printouts of children's collaborative artwork created during phase two. During my first round of interviews I asked "can you tell me about this drawing you made with your friend?" This question was eventually dropped from my line of questioning as children struggled to recognize the artwork I showed them. I attribute this to the fact that in most collaborative experiences representational works of art were rarely created. There also seemed to be a lack of ownership over the final piece. Perhaps these two reasons explain why many children failed to recognize the work at all. Since this question was omitted during implementation I replaced it with the more general, "do you remember drawing on the tablet with a friend?" When a child responded "yes" to this I would follow-up with "what did you enjoy most?" Here children seemed to understand what I was asking; however, they still found it difficult to conceptualize what they enjoyed most about the experience. I often heard "I don't know" and "I'm not sure." Another question asked "what did you enjoy least about using the tablet computer to make drawings?" Here I often received blank stares from the children. Marcus (five years old) was the only child who presented a recordable answer. He said, "actually there is something I don't like. I have a tablet too. But it is more little and has awesome games on it and not drawing" (phase four transcript, 4.30.14). Even with such profound insights I craved further information from the children

In order to gather additional interview data and ensure that children were providing accurate responses I initiated another round of one-on-one interviews. Prior to asking a modified set of interview questions I showed each child a video of themselves drawing on the tablet. After the video I asked the revised questions. Children's responses were more detailed, yet relayed the same overarching messages. Children were able to recognize the fact that they were using the tablet as a drawing tool, they recalled the subject matter of the work I showed them in hardcopy form, and they continued to decipher the differences between the tablet and the crayons and paper. When comparing the interview data from my first attempt to my second attempt the content of insights gathered remained consistent. Of the active child participants 17 were interviewed twice between weeks 13 and 14 of the research period. Three children were not available for an interview. These were instances in which the same child was absent from their normal tablet time two weeks in a row.

During the final week of phase four I conducted focus group discussions with each classroom involved. Twenty-six of the 30 consistent child participants were present during these group discussions. I began each discussion by showing a video I had compiled which highlighted artwork and brief video clips of each child working. Following the viewing I opened up with my first question. I used the same set of questions used during my second attempt of interviews, with the addition of one. I asked children "what do you like to use more, the tablet or the crayons." This produced some interesting responses. There were 22 overt votes for the technology and nine overt votes for the traditional materials. These were clearly identifiable responses ranging from "I like the tablet" to "I love the tablet" and "I like crayons" to "I like crayons more." Only

one child expressed verbally that he enjoyed both media options. Specifically, he said, "my favorite is both" (phase four transcript, Jacob, 4.30.14). While such a sentiment was unique it still seemed to be overshadowed by the perceived popularity of the tablet computer among child participants. One of the challenges of interviewing small groups of children, and particularly at this stage of development, is that participants will often mimic the answers provided by their peers. This type of social conformity was evidenced during my three focus group discussions, particularly in the beginning and following the first child's response. I often heard echoed sentiments from peers. As a result of this concern, more significant analysis was conducted when evaluating children's one-on-one interviews and also adult conversations.

Following focus group interviews with the children, I arranged interviews with the educators participating in the study. Three of the four involved participated. I asked the following guided questions to gain adult perceptions regarding the tablet. Modifications to my adult interview protocol were not necessary, as the educators participating understood the questions posed.

1. What were your initial thoughts when this study first came to your attention?
2. How do you feel your students responded to the tablet computer as a drawing tool?
3. How do you feel your students responded when asked to collaborate and draw on the tablet with a peer?
4. Do you feel the tablet computer has implications for learning in the pre-school setting? Why or why not?

5. Would you be tempted to use a tablet computer for instruction in the pre-school setting? Why or why not?
6. What are some ways you might use the tablet computer in the pre-school setting?

By holding such discussions with children and adults I was able to confirm findings from phases one, two, and three. I triangulated data gathered from artwork, videos, interviews, and focus group discussions to achieve saturation among categories. In the following pages I share those confirmed categories from the perspectives of children and adults.

Confirming child perceptions.

While succinct in their delivery child perceptions regarding the tablet as a drawing tool confirmed several of my observations during phases one through three of the study. When posed with guided questions children shared their thoughts regarding the tablet computer in addition to its benefits and limitations. I begin with their overarching perceptions of the tablet, as compared to other drawing tools, and as a gaming system.

Perceptions of the technology.

From the beginning of phase one children demonstrated their understanding that the tablet differed from some of the other tools they were accustomed to using, namely that the tablet required very little in order to operate. Unlike traditional materials, which require a drawing mechanism and a ground to make marks, the tablet requires one anatomical tool, the finger. This major difference seemed to make the tablet not only special to children but easy to use. As a drawing tool specifically, children also deciphered the differences between the presented technology and more traditional media

like crayons and paper. They expressed that with a tablet the user uses their finger for everything including mark making, saving, creating a new canvas, and choosing colors. In their mind this seemed to streamline the traditional means of drawing, which requires physically picking out a crayon in the desired shade, holding the crayon in a three-point grasp, and moving the entire hand to make a mark. The Discoverer group shared the following during their discussion:

> It is not like crayons. We draw on it with our finger and it is a little different. And it is like a marker but you have to use your finger to pick a pencil and then it works on it. (phase four transcript, 4.29.14)

Children in the Investigator classroom also shared several poignant thoughts. Gavin (five years old) offered, "because the crayons make the color that you want to do but the tablet you have to use your fingers" (phase four transcript, 4.30.14). Niles (five years old) also noted,

> Yes, it is like drawing with crayons. Because you pick the first crayon you want. But on the tablet I need to push, I need to push the color I want and with crayons you need to pick the color you want. (phase four transcript, 4.30.14)

While children compared and contrasted the tablet to other means of artistic creation there still seemed to be a disconnect in their overall perceptions of the tool.

While children generally seemed to enjoy drawing with the tablet and were able to discuss the tablet as a drawing tool when prompted, they did not readily accept the tablet as an art making device. Based upon children's statements throughout phases one, two, and three, and continued discussion during phase four, the tablet was regularly associated with gaming and play rather than creation. When asked their opinion of the

tablet as a drawing tool students were not shy to question my intentions, or even the role of the tablet at large. Children often used gaming language when talking about the tool. Common questions during earlier phases included "what games do you have," "are we going to play that drawing game again" and "can we play a different game?" Such questions seemed to be echoed in children's comments during phase four. Here is a comment recorded during a one-on-one interview:

> We use the tablet to play with. We use it, we play with it, and we make some things on it and we draw stuff because it's so much fun. I just like when I play games on my mommy's tablet…I don't like hard games …like you go turn on Mickey Mouse® – that's a good game for kids. (phase four transcript, Cindy, 4.30.14)

Similar comments during phase four included "I like the tablet because you can also make games" and "I have a tablet too. But it is more little and has awesome games on it and not drawing" (phase four transcript, Nolan, 4.30.14). Such statements imply that children readily equate the tablet with gaming and play time and are less likely to associate the tablet with art making.

Benefits of the technology.

When asked what they enjoyed most about the tablet as a tool surprisingly children often noted a drawing option, specifically, the eraser tool in Picasso®. Children appreciated the fact that they could erase their work, either partially or entirely. Several comments were heard during phase four which confirmed this benefit of the tablet. Gavin (five years old) said, "I like the tablet because…if you messed up your picture you could just erase it" (phase four transcript, 4.30.14). Gabe (three years old) noted, "I don't have

an eraser for crayons…yeah you can make something different and you can erase it with the eraser" (phase four transcript, 4.30.14). A group comment confirmed this consensus among children during a focus group discussion. The Investigators emphasized that, "the pencils [in Picasso®] are different from crayons. You can erase the pencils, but you can't erase the crayons" (phase four transcript, 4.30.14). In addition to being able to erase and alter their digital images children saw other benefits to the tool.

Children seemed to appreciate the fact that there was ample memory space for artwork on the tablet. Children regularly commented on the fact that crayons and paper have a lifespan. As Taylor (five years old) put it once, "crayons can break" and "you can run out of paper" (phase four transcript, 4.30.14). Children seemed to conceptualize that there was no certain end to tablet creation. In their minds they never ran out of digital crayons or digital paper. I consider another comment from the Investigator's focus group discussion:

> Because it's not the same as paper because you just press a button, but with the paper you have to get another paper and then you can draw out. But if you do on the tablet, you don't run out. The tablet that we have is different than paper because paper is not like that. The tablet never runs out of paper but the real paper does. (phase four transcript, 4.30.14).

Such a comment may be interpreted as flawed by those familiar with saving digital works of art, as it is possible to run out of memory space for drawings. However, in the minds of young children this does not seem to be a factor of concern and therefore it is a major benefit of working digitally.

Limitations of the technology.

While children appreciated that they could erase their digital marks and seemed to have ample space for their numerous artworks on the tablet, they also voiced complaints regarding the technology. During earlier phases children were critical of the color options available in Picasso® often commenting on the fact that purple and pink were absent. Recall Cassie's statement that "I can't find purple in that" (phase one transcript, 3.5.14). This sentiment was echoed during phase four, and was one of several statements regarding the superficial nature of the Picasso® application. Children commented that the pencils on the tablet were not "real" (phase four transcript, The Investigators, 4.30.14). This is data indicating that participants were able to decipher real from augmented experience. I recall a comment from the Investigator's focus group discussion when children shared that, "you could just pick the crayons. They aren't real pencils. They are like not real" (phase four transcript, 4.30.14). Here children proved their ability to recognize actual pencils and crayons from digital pencils and crayons.

Children were also critical of the size of the tablet itself because it limited the size of their artwork. In classrooms in which large pieces of paper and even rolls of paper are readily available for drawing and painting, this was an important point for children. The Creators shared that, "it's different! Well you know it is different than crayons and paper, because it is on a different thing. Cause paper is bigger than that. Like really long pieces you can get" (phase four transcript, 4.30.14). Such limitations were all areas of concern for children, yet these seemed minimal when compared to the benefits they noted of the tablet and their sheer enthusiasm for using the device.

This enthusiasm posed concerns for me regarding the reliability of children's statements as I began to rely more heavily on the thoughts of the adults to validate children's opinions. In the next section I discuss the views of the three educators interviewed during phase four. These educators touch upon children's perceptions, the tablet's benefits, its limitations, and other general observations regarding the technology.

Learning adult perceptions.

Cindy, Jennifer, and Susan were individually interviewed following conversations and focus group discussions with the participating children. From these interviews I gained valuable adult insights regarding the tablet as an educational tool as well as a drawing tool. I begin this section by sharing their unique perceptions regarding the tablet at large and their comfort level with the technology.

Although each educator employed at the Child Development Center is equipped with an iPad® there are variations in how individual teachers use them. Susan is the most proactive educator in regard to the tablet, introducing it about once a month in the classroom when applicable. Cindy and Jennifer are less likely to use the tablet as a student tool mostly because of a self-proclaimed naiveté regarding the technology. Jennifer shared the following comment during my interview with her, jokingly comparing herself to a sundial:

> I'm like a wind up watch in a digital age. So what were my thoughts? I don't have a clue! I have to laugh. So what are my thoughts? I didn't know how it would connect at all. With all those apps, I didn't know how you could do that until I saw you and there were all these colors and the kids loved it. But what did I think about it? I didn't have a clue. (phase four transcript, 5.21.14)

Jennifer, like many educators in the center, uses the tablet primarily as a documentation tool using is to take photographs and record videos of her students in action. Cindy uses the tablet in a similar way, as a teacher tool as opposed to a student tool. In addition to not having a lot of exposure to the tablet herself, Cindy has philosophical reasons for not introducing the tablet to young children. She shared the following comment during her one-on-one interview.

> Well I am using it to take pictures and record them. My age group, the three-year-olds, I was never a big fan of bringing the computers into the classroom because I think they need to really work on those social skills and they need to communicate with each other, negotiating and problem solving. This is why I never really allow computer work in my classroom. (phase four transcript, 5.16.14)

It seems that for Cindy the tablet takes away from some of the learning that can occur with more hands-on approaches. All of the educators, to a certain extent, commented that young children need to experience a variety of materials in order to learn. Even Susan, the self-proclaimed technology enthusiast, relayed that sometimes the tablet just "is not enough" (phase four transcript, 5.21.14) as many children this age like to get messy particularly when creating art. As Susan put it, they like having markers in their hands and "paint on their skin" (phase four transcript, 5.21.14). While a robust curricula composed of various real and hands-on experiences is valued in this school setting, there are additional reasons for the reluctance regarding technology.

Susan expressed other reasons why she is hesitant to present the tablet in the classroom setting. She shared the following during our one-on-one conversation.

> Honestly I only feel like I can bring it out at the end of the day when we have dwindled down to four or five kids. I have two of them (tablets), and one is the better one, the nicer one with the camera and nicer applications. Even with the two of them, if there is just one person that has to share, it is very tense. I hear 'stop touching it!' You just have to sit and watch and monitor. (phase four transcript, 5.21.14)

Cindy and Jennifer echoed these sentiments regarding the struggle to share such devices and the educator's role as manager and facilitator. It seems that the tablet, at least in the minds of these three preschool educators, is difficult to manage. For one it is an expensive device that requires some training to operate. It is also difficult to monitor and entrust among children, particularly if there are not enough devices to go around.

In addition to discussing their own perceptions of the technology, the three teachers interviewed offered their thoughts regarding the research. I learned that while I was engaged in one-on-one activity with each of their students they were looking on curiously to see what their students would create digitally. In the following pages I share their thoughts regarding the artistic development of their students, as demonstrated through the children's digital renderings.

Artistic development.

While discussing the tablet and its educational implications with the educators interviewed I also summarized the artistic development of each child based on my observations during tablet time. Jennifer and Susan confirmed that children's artwork on the tablet matched their natural artistic inclinations in the classroom. In other words, the types of drawings children were producing for me during tablet time closely resembled

the renderings they observed during regular classroom experiences. Additionally, artistically gifted students were noted during my conversations with these two educators. Specifically Gavin (five years old), in Jennifer's class, and Jake (four years old), in Susan's class were discussed at length. Jennifer shared the following regarding Gavin:

> He takes a lot of pride in his work. A lot of pride and it is not just the drawing, it's in whatever he does. He tilts his head and he is thinking, he is thinking. When he goes to his journal that head is tilted and you might think he is not doing anything, but he is thinking. So when he gets started he has his idea right on down to the very last detail. That is Gavin. He is really something. (phase four transcript, 5.21.14)

Similarly, Susan had this to share about Jake:

> Jake has always been very artistic, in anything artistic that we do, he will be the boy that goes over there, and I mean anything. And I mean anything…dramatic arts, he likes that, visual arts, he likes that, anything. He takes it very seriously. (phase four transcript, 5.21.14)

Jennifer and Susan were eager to talk about their students and confirmed that many of the drawings I was documenting digitally demonstrated children's artistic tendencies accurately, particularly among those they considered gifted.

While Jennifer and Susan were not surprised by the digital works of their pupils one educator remained skeptical. When I shared children's portfolios with Cindy she confirmed a disconnect between students' digital and traditional renderings. According to Cindy her students work much more representationally when provided crayons, markers,

and other traditional art media as compared to the tablet. Kevin (four years old) was the case she used to illustrate this point:

> I am surprised to see his drawings here. I think they (her students) are just so fascinated with the movement, how quickly everything would move, and so instead of taking time to do representational work, they get more out of it by just doing zigzags and scribbling. When he goes to the easel he uses a lot of colors and it becomes a rainbow, it is representational. He paints a rainbow and he uses all of those colors. And isn't that something. He scribbles on the iPad®, but draws representationally on the easel. (phase four transcript, 5.16.14)

There are additional factors that could lead to this difference in opinion between Cindy, Jennifer, and Susan. One large factor could be the age difference in Cindy's class, as she works with a larger population of three-year-old children. As one of the younger groups of children included in this research Cindy's students are at different stages of cognitive, social, physical, and artistic development compared to their older counterparts. Jennifer and Susan also encourage the use of desktop computers in the classroom, whereas Cindy does not. Even a small amount of exposure to digital tools may influence children's perceptions and intentions with technology at large. To probe such a query further I asked the educators how they felt children responded to the tablet, specifically as a drawing tool.

Perceptions of the technology.

While educators noted mixed feelings regarding their own perceptions of the tablet as a learning tool, all three agreed that children warmly welcomed the iPad® in the preschool setting. At first educators noted that such enthusiasm was likely due to

children's prior knowledge of the tablet, likely attributed to household ownership. Cindy said the following during our one-on-one conversation, which was equally echoed by Susan and Jennifer:

> I think they responded very well because most of the kids we have now are into this modern technology. They have the experience with the tablet. Most of them have them in their homes, so I think with just a little training it applied to them. They had some prior knowledge about what they were going to be doing. (phase four transcript, 5.16.14)

Such comments were confirmed after re-evaluating parent surveys and the transcripts of children as they informally spoke about their experiences with technology. It is important to note, however, that a few children involved in the study did not have access to tablets at home. Cindy brought up one particular student and attributed her enthusiasm for tablet time, and also her reluctance to share the device, to the lack of exposure at home:

> Emily, she was probably excited because when I had parent teacher conferences I learned that she never uses the computer. They never let her use the computer at home. They told her they were participating in this study to prepare her…she never uses it. (phase four transcript, 5.16.14)

Through our discussions educators quickly realized that children, regardless of prior knowledge, were excited to use the tablet during this study. The question then, was why? The answer, according to educators, was that although the tablet itself was not new to a majority of child participants, the act of using it in the classroom and, specifically, for artistic purposes was novel. Susan, Jennifer, and Cindy agreed that introducing the tablet in an academic setting with a specific task in mind was intriguing to students, not to

mention the fact that I, as the only researcher for this study, was someone unfamiliar and of interest. Since the tablet was used rarely among the educators involved children perceived my weekly visits as something novel and exciting.

Susan confirmed that children responded to the tablet enthusiastically, while also pointing out that such an interest can have a negative impact upon student behavior. She shared the following during her interview.

> I think it would be good if it would diminish a little bit…the novelty. Because there would be less fighting. If it was seen more as an accessible tool then they probably would not fight over it as much. So I do not pull it out all of the time. (phase four transcript, 5.21.14)

Here, Susan reiterates the difficulties in monitoring one device among numerous students, which leads to issues of demand. In other words, the fewer the devices, the more likely children are to argue over who gets a turn and when. Perhaps this is why I too experienced the occasional child dispute regarding the sharing of tablet time.

While educators noted that children were motivated to use the tablet early on in my study, they also recognized that over time enthusiasm for the tool or the activity I asked of them faded. For some children the act of drawing on the tablet seemed to lose its appeal. Jennifer attributed some of this dwindling enthusiasm to short attention spans in children using Taylor (five years old) as an example:

> I would notice when she would go back, her time with you would be very short. She would go and come right back out. And so I wonder, because her attention span is very short. She can attend, but she is very curious about the world. She always wants to know what is going on around her and so she flits, that is my

> word for her. She could be over here and engaged and then she hears someone over there laughing and she drops it. So if we were doing something out here that she thought she was going to miss she would go back there and rush. (phase four transcript, 5.21.14)

Jennifer also noted that children seemed to realize early on that tablet time was not a required activity, but instead, supplementary. As a result children began to prioritize activities. As such, some began to gravitate towards the tablet less over time because there were other pressing activities aplenty. Jennifer reflected on how children responded to tablet time compared to required instruction, implying that novelty among her age group of students can be fleeting:

> Coming over for small group is never a novelty, but I might say you can play and you are free to play, but when I call you over you need to come over. They stay because they know in order to get back they have to satisfy this, but if it is a matter of I can go here and spend as much time as I want it would be the same thing. So there is novelty, novelty in the beginning if it is not something they have to do, but if it is something of high interest they would have stayed with it. They would have stayed with it. (phase four transcript, 5.21.14)

So it seems that the educators also recognized that while the tablet itself was not novel at first the activity I asked of children was. Over time the novelty of drawing with the tablet seemed to lose its appeal among children.

Related to the issue of novelty, educators also mentioned children's perceptions of value in regard to their digital artwork. Those interviewed agreed that children placed more ownership and value on their traditional drawings as compared to their digital

renderings. When probed further, educators attributed this lack of value to children's inability to comprehend the act of saving a digital work of art. Susan stated this when she noted, "I don't think they understand the concept that it can be saved and it can be their work" (phase four transcript, 5.21.14). All three educators emphasized the importance of immediate gratification among preschool aged students, and since children could not create a tangible artifact documenting their artwork it lost value. Susan put it nicely when she stated, "I don't think they take as much ownership in what they do here…but a real piece of paper with paint, they think I did this, I need to keep it. I need to put it on the refrigerator" (phase four transcript, 5.21.14). This, of course, was a restriction of the study in that children could not print out each digital artwork. Whether this could heighten a sense of value among children can be explored in a future study.

Following lively discussion regarding children's early enthusiasm for the tablet and reasons for dwindling interest, educators also discussed children's associations regarding the device as a gaming system. According to these three educators few young children approach the tablet with the intention to draw, or even to learn. The primary intention they see among their young students is to play games. Susan pointed out this concern in relation to drawing. She stated that:

> We have drawing apps on our tablet, but they hardly ever go to them. The one they go to the most has stampers and they like it because it makes noise. Every time they stamp, it makes noise. And they will go and they think it is funny. In their mind it is more of a simulation. (phase four transcript, 5.21.14)

Susan's colleagues echoed her thoughts, believing that children do not look to the tablet as a drawing tool, but instead as a gaming tool. Jennifer noted her son as an example:

> My son has a Leapster® and there is a doodle app and I think he only likes it because it gives you a task to draw with, so it is not just like a free draw, it provides a problem and you have to fill it in or fix it. So it is a drawing but with a problem solving background, kind of like a game. (phase four transcript, 5.21.14)

While the educators interviewed shared this opinion that children look to the tablet as a game system, and not a learning tool, their language relayed another possible explanation. When the teachers described the tablet they too used descriptors commonly used for games and gaming. It seems possible then that children and adults alike look to the tablet as a gaming system, even when learning may be the purpose for introducing the tool. Perhaps this is a contributing factor when considering children's perceptions of the tablet. If adults use game-like language when describing the tablet and its features it is likely then that children might also describe the tablet in such a way. For example, Jennifer said once, "I do know that the games they have on there are all academic. They are games, and they love it. But it is a game" (phase four transcript, 5.21.14). Such statements were heard widely among educators throughout the course of study. Whether and how this impacted children's perceptions of the tablet is still unclear and additional research may provide further clarity in this realm.

Benefits of the tablet.

In addition to discussing children's perceptions of the tablet as a tool, educators touched upon the benefits of using such technology in the preschool setting. Even educators like Cindy who was hesitant to introduce computers to young children saw the potential of the tablet. All three educators noted the malleability of the tablet in being

able to erase previous marks and manipulate the screen in different ways. The educators also noted the calming ability of the tablet, particularly for children with special needs.

While reflecting on the comments of her students Susan stated, “that is one of the things they said they liked about it that you could erase. If you made a mistake you could erase right away and with crayons they could not” (phase four transcript, 5.21.14). These sentiments were echoed among the educators interviewed, emphasizing that this act of erasing gives children a sense of control over their creations. If they do not like a particular mark or are unsatisfied with a drawing at large they are free to begin with a new slate. This is something children cannot do with crayons and paper. According to the educators, this freedom helps build independence in children, which is important when building confidence in emerging skills. Cindy noted Kevin (four years old) as an example, who is in the beginning stages of inventive writing and practicing motor control. Cindy highlighted the experimental mode in which he and other children can work on the tablet and practice important skills like writing with little pressure for perfection because of the ability to erase.

In addition to the manipulative power of the tablet educators recognized the technology as a calming mechanism for children with special needs. Susan emphasized that when used as an individual activity center the tablet can help calm emotions in children who may otherwise struggle in social learning situations, or when too many work options prove problematic. Regardless of these two benefits educators also saw limitations to the technology.

Limitations of the tablet.

According to the educators interviewed there are several pitfalls to introducing a tablet in a preschool setting. These include management issues, interface concerns, and social implications.

When asked specifically about the tablet's limitations as a tool Susan again brought up the point of management. While children exhibited competence in the basic workings of a tablet computer it was also easy for them to become distracted by a variety of applications. The tablet requires adult monitoring, especially among young children. According to teachers like Susan, adults must be present to re-route children's attention, re-open programs, and to troubleshoot when necessary. As per my experience the tablet can fail. It can shut down unexpectedly and children are not equipped to problem-solve these sorts of technical issues. Instead an adult must be present to monitor and consult.

Susan also noted the importance of introducing young children to multi-sensory stimuli, emphasizing that the tablet is strictly a visual object. True, children interact with the tablet kinesthetically, with one finger, but to Susan and the other educators this is not enough. Susan described her students as sensory learners in the following quote:

> Some of them really need something in their hands. They are still very sensory and this [the tablet] is not sensory for them, other than visual. For some [children], especially the younger ones, they need to get messy. They like paint on their skin and markers. (phase four transcript, 5.21.14)

Susan and the other educators interviewed believe that the tablet, while it has many benefits, also represents just one tool in a vast toolbox of media. They agreed that children must be exposed to a variety of tools in order to appeal to multiple learning

styles. Keeping this in mind, the tablet cultivates major apprehensions among those educators interviewed regarding the way learning may take place in the future. Jennifer shared her concern in the following quote.

> We will not know until years down the road what effect this is going to have. There is going to be a generation very shortly, maybe this one, that does not know the feel of paper or a book. And we need that. I do not know if it will be good, bad or ugly, we just do not know. (phase four transcript, 5.21.14)

For many educators this concern of the unknown and how technologies like the tablet computer will impact future generations of learners is quite daunting.

Another challenge when introducing the tablet to preschool aged children, as noted by educators, is in regard to social experiences. Among the three educators interviewed there was consensus that the tablet computer is not an adequate tool for fostering prosocial behaviors. With its difficult to share interface and compact size children struggle when collaborating with the tablet. This, in combination with the limited social development of participants, can create challenging situations. Cindy stated that:

> Taking turns, that is hard for them, because this is how a three-year-old learns, by touching and feeling. It is also hard for some of them to wait their turn. Kids like their turn and they do not want to give it up for someone else's. (phase four transcript, 5.16.14)

Educators confirmed the belief that the tablet could not be shared easily among young participants, yet it did have potential among older children. Encounters among older children were more civil the more prosocial the participants. Jennifer pointed out Niles

(five years old) and Marcus (five years old) as two of the older child participants who were "practiced in" (phase four transcript, 5.21.14) prosocial behaviors, and able to negotiate the tablet's small and difficult to share interface. Such encounters were rare, however, within the scope of this research sample.

Chapter Summary

This chapter reviewed the data collected during this research study and presented the accompanying results. Each phase of research was detailed including the preliminary measures adopted to observe the research site and become familiar with the adult and child participants. Phase one produced data concerning children's artistic development and their perceptions of the tablet, as well as the benefits, and limitations of the technology. Phase two offered data concerning the social implications of the tablet computer. Phase three brought to light children's preferences in media as well as the unique encounters with the tablet. Phase four presented data, which triangulated children's comments and adult perceptions with data from previous phases. In the concluding chapter I discuss these findings and their implications for the tablet in the world of academia, specifically, the art classroom setting.

Chapter Five: Discussion

This study was designed to add to educators' understandings of how the tablet computer can support learning, specifically in regard to artistic development. The study employed qualitative methodologies using grounded theory measures for data analysis in order to explore timely questions regarding the tablet computer and how young children react to such technology as a drawing tool. I worked with an early childhood center, three classrooms, 30 children between the ages of three and five years old, four educators, and 35 parents in an effort to gather substantive perspectives regarding the tablet and its artistic potential. In this concluding chapter I interpret and further reflect upon the research findings regarding the tablet, its implications for drawing, and its potential impact on learning at large.

Major Findings

Chapter four presented the major findings from this study through a series of stories. The main characters of those stories included the children and teachers involved in this investigation, their reactions to the tablet computer, and their perceptions of the technology. Over the course of this 15-week investigation I came to several conclusions regarding the tablet and its implications for learning, specifically, in terms of artistic development. In this final chapter I first summarize my major findings thematically. I discuss the tablet, its benefits and limitations, its implications for social learning, as well as its implications for artistic growth, and I ground such statements within the research and in accordance with my original research questions. These questions have been reorganized and revisited below in an effort to more eloquently express the tablet's implications for learning, its potential for cultural change, and its role in art making.

1. What prior knowledge do children have regarding tablet computers and similar technologies?
2. How do children navigate a tablet computer when drawing in pairs?
3. How may drawings created on a tablet computer show evidence of a child's artistic development?
4. How do children draw on a tablet computer compared to traditional media, like crayons on drawing paper?
5. Do children exhibit preferences in drawing tools? Do they prefer the tablet computer over traditional media such as crayons on drawing paper?

Prior knowledge, benefits and limitations.

What prior knowledge do children have regarding tablet computers and similar technologies? Overall I found that child participants were well versed in the tablet and its abilities, and found it easy to use. Child participants, when surveyed formally and informally, indicated that they were quite familiar with the tablet device or similar machines like touchscreen phones. Adult participants, namely parents of children participants and the educators involved in this research, also maintained a strong familiarity with the tablet, however some expressed greater confidence levels with the tool then others. Overall, the general familiarity participants had regarding the tablet made implementation of the device easy among this population.

The ease to which children acclimated to using the tablet as a tool proved to be a benefit to introducing a device like the iPad® in a preschool setting. Even the youngest of child participants exhibited comfort and confidence when operating the device. With just the push of a button children were able to turn the tablet on, and with a few swipes of the

finger, they were able to access and operate a plethora of tools. I was additionally relieved that children seemed unphased when we transitioned from a Xoom® tablet to the iPad® tablet. Even those few children who had little to no access to tablet technologies in their home environment exhibited ease with the tool. I attribute such ease of use to two variables. One, children, and particularly young children, are curious about and motivated by technology in the classroom. I also attribute this ease of use to strong product design. The tablet, and specifically the iPad®, is ergonomic and simple in design. It is an intuitive tool even for the youngest of users. As such, the iPad® would be defined as a sophisticated device that can be used in productive ways according to the Human-Computer Interaction field discussed earlier in chapter one. Its user-friendly nature aligns with Karray et al. (2008) who noted the importance of a strong physical aspect in determining the interaction between human and computer. The researchers also emphasize the importance of an affective aspect, which ensures a "pleasurable experience" (p. 139) as well as continued usage of the device. In the case of this research, even when novelty concerning the act of drawing on the tablet seemed to decrease over time, children still expressed a desire to work on the device at large demonstrating both a strong physical and affective aspect.

When it came to drawing, children also took very quickly to the Picasso® application used during this research. Initially I anticipated a learning period in which participants would need time to acclimate to both versions of the application. To my surprise this period was almost non-existent. After just one or two brief tutorials children were operating the Picasso® application independently.

An additional benefit of the tablet, specifically in regard to drawing, is the ability to erase and rework previous markings. This was a significant perquisite in the eyes of child participants who appreciated the fact that they could manipulate their tablet drawings in ways they could not control traditional drawing materials, like crayons on paper. This ability and freedom to erase, or to start anew, seemed to unlock a sense of experimentation and risk taking in child participants. This observation aligns with the writings of Hurwitz and Day (2007) who specify ages two through five as the manipulative stage of artistic development. They define manipulative as "a general stage of initial exploration and experimentation with any new materials" which over time becomes "increasingly controlled…more purposeful and rhythmic" (pp. 47-48). Within the scope of this study I observed young children experimenting with the eraser tool on the tablet at first and then using it purposefully to rework their compositions. This served as evidence that children not only appreciated the sense of control the eraser tool allotted, but that they were capable of rethinking and reorganizing previous marks. Overall, children seemed aware of the fact that their digital renderings were not permanent.

Yet this idea of permanence, and lack thereof, also served as a limitation of the technology, at least from a researcher and teacher perspective. It was because of the manner in which children approached the tablet, with a sense of manipulative discovery, that they often forgot or failed to save their digital works of art before erasing. As the adult facilitator it became commonplace for me to remind my young participants to save their works of art. While children would succumb to my requests over time, for them, saving their digital works initially seemed meaningless, suggesting that child participants placed little value upon their tablet drawings, instead equating tablet time with

experimentation and play. Yet, there is another possible explanation for this seemingly lack of value concerning digital works of art. I relay back to my discussion in chapter two regarding cognitive theory, which implies that preschool aged children are not yet developmentally ready to encode or create long lasting memory. As such, "even if preschoolers have a memory trace…that does not mean they will retrieve, or access, the memory trace later" (Svinicki, 2004, p. 100). This struggle is overcome as children mature and become better able to access retrieval cues. Perhaps instead of a genuine lack of value this could be the explanation for the need to repetitively show children how to save their works of art. Cognitive theory points to the need for repetition in order for children to retrieve and access new information such as how to properly save a work of digital art. As devices like the tablet computer are continuously employed in spaces like art classrooms, perhaps such a need will diminish. Certainly additional research in this domain could shed light upon such an inquiry.

While ease of use was a noted benefit of the tablet it was also seen as a limitation according to this research. As noted previously, the tablet and the Picasso® application were intuitive for young children, which was likely due to prior knowledge and familiarity with the tool. This perceived strength is also a limitation, as the ease to which children can navigate the tablet can also threaten how they focus. Within moments children can easily navigate away from a desired application and begin exploring other tools accessible on the tablet. In an academic setting in which multiple tablets are available, and only one teacher is present to supervise, such ease of use could pose a threat to curricular goals. I am reminded of the work of Bruning et al. (2011) who "suggests that well-designed computer programs not only can produce deep learning

outcomes but also can scaffold such metacognitive processes" (p. 227). In order for technology design to be strong, it must take into account how our cognitive system works as well as how complex cognitive skills develop. As such, "good design works with, rather than against, our cognitive systems" (p. 228). The tablet used for this research was well designed, easy to use, and encouraged curiosity in the child participants involved. It also, however, presented a challenge, specifically when it came to encouraging focused and purposeful activity. Some children simply could not resist other tablet functionalities despite the task at hand. This observation presents the need for additional study regarding Human-Computer Interaction, the tablet computer, and issues of attention in young children.

A third limitation of the tablet, in general, is in regard to tool failure. Throughout this course of study the device occasionally faltered. Whether it was the iPad® tablet itself or the Picasso® application used periodically the tool would freeze or unexpectedly shut down. This encourages teachers and adult facilitators to anticipate potential tool failure and have a plan in store for troubleshooting. As in the case of this research, when the tool did falter, it was not the child participant, the implied native, who automatically searched for a solution, but instead the adult researcher.

A fourth limitation is specific to the Picasso® application utilized for this study. While the Picasso® application used on the Xoom® tablet provided access to a seemingly limitless color palette, the paint colors available via the iPad® tablet version were limited. Children regularly asked for pink or purple, not available in the Apple® version, and often attempted to mix colors. This interest in color was evidence that child participants were considering the function of color in their compositions in powerful

ways, sometimes as a descriptive measure, and other times in association with moods or feelings (Hurwitz & Day, 2007). When participants were unable to mix their desired shades it became very clear to them that digital paint was different than real tempera or acrylic. Sometimes this lack of control proved stressful to participants; however, often children would eventually choose another color to serve their purpose. Regardless, the application used proved limiting with regard to developing color awareness among this population of children. Hurwtiz and Day (2007) emphasis the importance of color mixing in helping children further control and understand the art making process. My research implies that while digital paint is exciting and motivating for young children, they also require access to real paint, which they can physically mix and experiment with while developing a broader understanding of color (Hurwitz & Day, 2007).

Drawing in pairs and the social implications.

How do children navigate a tablet computer when drawing in pairs? An added limitation of the tablet involved its implications for collaborative learning. It was only in pairs in which both children exhibited prosocial skill sets that collaboration was possible and productive, sometimes leading to detailed representational drawings. When pairings featured two children who both struggled during regular social interactions the tablet failed to elicit collaborative work; the tablet was not a social buffer. Children struggled to share the device and emotions would often become heated. This observation aligns with Piaget's (1936) understandings of children at the preoperational stage of development. As egocentric individuals participants were not only hesitant to share the tablet, but they also failed to understand why others were invested in the same experience. Such understandings were confirmed by classroom educators involved in this study through

informal and formal conversations in which they noted that children of this age are regularly challenged by social encounters. Several educators also noted that collaborative experiences involving art materials such as large banner paper, crayons, and paint occur only rarely in the regular classroom setting. The infrequency of this sort of activity is motivated by educators' prior experiences in facilitating collaborative and cooperative art making, which often results in frustrated children and heated emotions, much like what I observed during phase two of this research. In the case of this study, adult facilitation by the researcher was often needed in order to help children calm down and come to a solution. Most often such a solution involved separate and individualized work time with the tablet. Even in situations when one child exhibited prosocial skills and the other struggled pairs rarely produced genuinely collaborative renderings.

In addition to the natural challenges associated with this age group a physical attribute of the tablet itself made collaboration challenging. Tablets like the iPad® are difficult to share, as only one finger can interact with the touchscreen interface at a time. The experience of drawing on a tablet with a peer is quite different then when compared to drawing collaboratively on a piece of paper with crayons where each participant can dawn their own tool and mark in unison. Yet, even when collaborating with traditional materials, like crayons on paper, children of this age struggle with a sense of ownership, as it is difficult to identify who the artist is when multiple individuals are involved in creation. The same struggle may be applied to digital works of art.

Based on such variables, and the observations of this study, it may be that introducing the tablet computer was a moral dilemma for this population of children (Kohlberg, 1981). This dilemma involved sharing one device to make one work of art

collaboratively. Over time it became evident that some children responded positively to the dilemma and some negatively. Children who responded positively to the experience seemed to enjoy working with a peer and often showed strong leadership qualities amongst other prosocial characteristics. During these interactions children demonstrated strong listening skills, shared the device easily, took turns drawing, and remained calm even when they were not operating the device themselves. For those children who had difficulty sharing, or expressed anger or frustration when working with a peer through words or body language, the tablet lacked the ability to encourage collaborative learning. While the tablet may be integrated to encourage practice with social encounters this only seems successful among children who exhibit prosocial skillsets already. Among children who struggle socially the tablet can potentially result in heated frustration between young users. Such observations remind me of the writings of Stetsenko (1995) who believes that the process of drawing should not be thought of as an isolated experience, but instead, considered one process "aimed at an overarching task of mastering social-semiotic ways of communicating" (p. 150). If Stetsenko perceives art making as a social experience, the tablet as a media choice seems to combat this, as a majority of child participants in this study preferred to make digital artwork alone and without influence from their peers.

This is not to say that during the course of this research social learning was never observed. Indeed, children regularly observed one another during one-on-one time with the tablet, sometimes using each other's subject matter to inspire their own digital and traditional drawings. These instances of learning align with social cognitive theory, which "asserts that there are other ways to learn and other forces that influence behavior" (Svinicki, 2004, p. 241). The child, according to this theory, learns through the

observation of others. Within the scope of this research then, it can be inferred that while young children may learn by observing peers working on a tablet device, they express difficulty and frustration if and when they are asked to share, and specifically, to collaborate in that learning.

Artistic development, the comparison of media, and emergent preferences.

How may drawings created on a tablet computer show evidence of a child's artistic development? How do children draw on a tablet computer compared to traditional media, like crayons on drawing paper? Do children exhibit preferences in drawing tools? Do they prefer the tablet computer over traditional media such as crayons on drawing paper? In addition to studying the social implications of the tablet computer I explored its potential for drawing in the art classroom. During the course of this study I identified whether or not children's drawings on a tablet computer were an accurate indicator of their artistic development, and whether the tablet was a viable tool for encouraging artistic growth. Additional observations concerning how children drew on the tablet as compared to crayons on paper, and whether or not children held preferences in drawing media were documented.

The young children involved in this study represented varying levels of artistic development. The youngest children, those three years old, generally remained in a scribbling modality during the course of research (Lowenfeld & Brittain, 1987). These drawings, while sometimes highly elaborate according to the child, were difficult to identify to the adult eye. As such, it was not unusual for the youngest children to scribble on the tablet as well as on paper with crayons. Older children participating in this study were generally found to be in the preschematic stage of artistic development (Lowenfeld

& Brittain, 1987). These children made sophisticated and detailed renderings, which coincided with equally complex art speak as they verbalized what they were drawing. Older children in this study showed evidence of Piaget's (1936) preoperational stage of development in which symbolic function plays a key role in thinking. This is the "ability to use one thing to represent something else," or in other words, "to use one thing as a symbol to stand for some other thing, which is then symbolized" (Harwood, Miller & Vasta, 2008, p. 241). Language skills during this phase "virtually explode" and "rapidly increasing vocabulary provide labels for newly developed schemas and serve as symbols that enable children to think about objects and events" (Ormord, 1995, pp. 40-41) even when they are not in sight. Such characteristics were evidenced by children's elaborate descriptions of their artwork. Additionally, older children participating in this study were conscious of their color choices when drawing, and they regularly filled the compositional frame, both characteristics of maturing artistic development (Hurwitz & Day, 2007).

A surprising observation involved child participants who seemed to be in state of artistic limbo. These were children who drew representationally with crayons and paper, showing signs of preschematic tendencies, yet they scribbled on the tablet. There were also instances noted where children would bounce between media and modality. Such children might create a representational drawing with crayons, then a scribble with the tablet, and then a representational drawing on the tablet. As mentioned in chapter four, there was no clear correlation between mode and media. A simple explanation for this state of artistic limbo is the unavoidable transition period between the scribbling state of artistic development and the preschematic stage. Graduating from one stage to another is

never black or white. Children do not simply stop scribbling and start drawing representationally, but instead dabble in both modalities. It also is not unusual for children to revert to a prior modality when engaged with a new or unique media, perhaps in this case the tablet computer (Hurwitz & Day, 2007).

Yet, I suggest that the solution is not so simple, as there were less obvious cases of what I refer to as a digital disconnect, which imply a divergence in how children consider their tablet drawings as compared to their traditional renderings. Such cases involved significant discrepancies in the amount of detail children included in their digital works. I think of the older children who ranged in age from four to five years old. All were capable of highly detailed preschematic renderings, yet when comparing their crayon drawings with their digital works of art there were marked differences. These differences ranged from the amount of detail featured in the end product to the length of time needed for completion. Often older children took more time to create their traditional crayon drawings, which in the end featured more detail and visual information. Educators involved in this study were aware of these differences in children's renderings, often pointing out such visual discrepancies. These observations align with the findings of Picard, Martin, and Tsao (2014) who identified "fundamental differences" (p. 210) between children's digital works and their traditional work. Perhaps children consider traditional media like crayons to be more precise instruments for drawing lines and details compared to their fingers. An exact explanation for such a phenomena remains unclear and additional research in this domain might shed further light upon such a quandary. Specifically, a study, which explores children's perceptions of traditional media tools compared to use of their finger could be conducted. During this study

children were provided access to a stylus early on, however often children would use the tool momentarily before setting it down and continuing to work with their finger on the tablet surface. While children in this study seemed uninterested in using a stylus while operating the tablet a future exploration could compare and contrast children's digital renderings made with a stylus to drawings made with their fingertips. Based upon this current research I attribute concerns of permanence to such differences in renderings, as it seemed that child participants placed more emotional value on their traditional drawings and, as a result, spent extra time perfecting their work. This would further explain instances of replication in which children would first practice a rendering on the tablet prior to making a final composition on paper with crayons.

When asked what they enjoyed more, the tablet or the traditional art materials, a majority of children expressed a greater appreciation for the technology, yet their actions told a different story. In all participants spent roughly the same amount of time with the tablet as they did with the paper and crayons during phase three, inferring that while their young minds may be inclined to use and be curious about the technology, their bodies require exposure to a variety of experiences and materials. This statement aligns with educator perceptions who expressed a sense of worry and distress in regards to educational technologies. During formal and informal discussions throughout the study educators emphasized that their students needed to manipulate materials, get messy, and socialize face-to-face with peers. These are important and valued elements of the preschool setting, all of which, they feel are being threatened with the encouraged onset of tools like the tablet. As a result, the educators involved in this study have taken a proactive, yet guarded stance in regards to tablet computers in the preschool classroom.

They understand the tablet's value in encouraging 21st century skills, and they also know that children are highly motivated to work with such tools. At the same time, each are leery of tablets taking over the classroom, as they emphasized the need for balance between new tools and more hands-on approaches. They are also realists noting that it is difficult to manage such expensive tools within an active classroom. While the iPad® itself is minimalist in design and easy to operate, its potential for learning is limitless, and this is daunting to some educators who are not prepared to incorporate technologies in the classroom scene. There are also issues of tool failure, or the simple problem of access, which can influence teachers' implementation. Within this particular setting each educator had access to at least one tablet computer. Perhaps in a setting in which more devices are accessible educator perceptions would vary. Additional research in classrooms with a one-to-one ratio of tablets to children would gather interesting results.

Considering these observations, this researcher would not recommend replacing a traditional art curriculum involving various hands-on materials with a strictly digital and tablet-driven agenda, as there is little evidence that children's digital drawings accurately match traditional versions. There is also evidence that children themselves crave experiences with a variety of artistic materials. As such, a well-rounded and holistic art curriculum must involve a plethora of media tools and options, digital and traditional in nature.

Tablets and their Implications for Learning

Perhaps another reason why educators might hesitate when incorporating tablets into any curriculum, let alone the art curriculum, is because of existing child and adult perceptions regarding the tablet generally, and as a learning tool. This research suggests

that perception and the manner in which we consider a particular tool is an indicator of its potential, in this case in the early childhood classroom.

During phase one of this research young children's perceptions of the tablet at large, as a learning tool, and as a drawing tool were recorded. During phase four these perceptions were confirmed and educator opinions were also gathered. Overall, when speaking about the tablet, children and adults alike referred to the device as a game system and something to play with. Through the recording of formal and informal comments from various participants it can be implied that such a perception regarding the tablet as a tool influences actions involving the device.

Child participants involved in this study often associated the tablet with gaming. Statements and questions regarding the tablet included: "What are we going to play today?" "Can I play with the tablet now?" "What other games do you have on the tablet?" "I have a tablet that I play with at home." Such questions and comments were common among this particular population of children, and so it may be inferred that children of this age often consider such a device a tool for play rather than learning. Such an inference is not unusual when observing young children in a preschool setting as children learn through exploration and play. However, what made such an observance unique was when children were asked to associate the tablet with creative play, and drawing in particular. Even while participating in the act of drawing digitally with the iPad® tablet children seemed to disassociate the device with the action. Some children would go so far as stating that the tablet was not a drawing tool, but a gaming tool. So it seemed, that regardless of the action, any activity completed on a tablet was a game according to the young children involved in this study. Perhaps a developmental explanation for this exists

concerning young children's pre-operational thought processes, which make it difficult for them to absorb the ambiguity of one action being described in multiple ways. The act of perceiving an action, which adequately portrays the lived experience, involves advanced processes of adaptation, assimilation, and accommodation, which very young children are still developing (Piaget & Inhelder, 1956). Additional research concerning the words specifically used by children while interacting with a tablet on a regular basis may shed light upon concerns regarding popular language, which describe the tablet and its functionalities.

Additionally, there are other potential factors that may contribute to children's perceptions of the tablet and their statements regarding, and specifically, as a gaming tool. I found that the educators involved in this study may have influenced such perceptions. During numerous informal and formal conversations with the four educators participating, I documented similar descriptions of the tablet as a gaming tool. It is highly likely than that through observational learning children heard their teachers speak of the gaming quality of the tablet computer and followed suit. This is not unusual for children experiencing preoperational thought, as often young children "imitate behavior either internally or externally" (Hardiman & Zernich, 1980, p. 14). Perhaps other influences reside in the homes of child participants. When re-evaluating parental surveys, a majority of parents reported that gaming was a popular activity on home tablets. While this study did not probe parents' use of language circling tablet usage in the home further research in this domain may provide additional clarity in this realm.

The potential for future research is vast and this study confirms the importance of considering the perceptions of children and adults when technology is incorporated.

When doing so additional questions will continue to emerge. For instance, is it possible to transform children's perceptions of the tablet as a gaming interface, and help them realize that the tablet can be used for a variety of learning and creative purposes? I believe this is possible with time and modeling. The more often adults, namely educators and parents, talk about the tablet in reference to learning and artistic activity the more readily children can associate the tool with activities other than gaming. Yet, when speaking about the tablet and modeling meaningful and productive activity with the tool, we must also acknowledge a balance between technology and traditional experiences. Children need to manipulate materials, they need to use their hands, and they need to encounter face-to-face social interactions.

Tablets as Cultural Change Agents.

The major findings from these results and the discussion of child and adult perceptions of the tablet lead me to qualify earlier observations concerning digital natives, digital immigrants, and digital wisdom. These results allow me to question the works of Prensky (2001, 2009, 2010), Tapscott (1998) and other proponents of technology who suggest that such tools will promote vast changes in society, including influencing how we communicate and how we learn. Such stances imply that there have been significant shifts in culture because of increased exposure and use of technologies. Based upon data and observations from this research I suggest an alternative to this determinist view of technology.

To begin such a discussion, I revisit the terms digital native and digital immigrant and apply Prensky's (2001, 2009, 2010) concepts to the participants in this research, most of whom would be classified as digital natives. Ranging between three and five years of

age, these children are presumed natives as they have been born into a technologically rich society. According to Prensky (2001, 2009, 2010) it was assumed that the young participants would take quickly to the tablet computer and utilize it in ways that might challenge the continued usage of more traditional means to play, create, and learn. From this study I learned how this specific population of children perceive and utilize the tablet computer, specifically for drawing. It is true that child participants required little to no introduction to the tool and were able to operate the tablet with tremendous ease, which aligns with Prensky's (2001, 2009, 2010) notions. What fails to align with his theory were my observations of how children used the tablet as a drawing tool. While the tablet proved motivating and children genuinely enjoyed working with the device, their digital renderings, as compared to those made with crayons on paper, contained much less visual information and were completed in a shorter amount of time. Based upon these observations, the tablet, as a drawing tool, does not always accurately portray a child's true artistic tendencies, let alone promote significant creative growth in young participants.

Also notable is the way in which children perceived the tool consistently from the beginning of the study to its conclusion. The children did not identify the tablet computer as a drawing tool. This perception is important when considering the debate regarding the existence of digital natives and digital immigrants. Again, while this research was not designed to dispute such terms, it does take a position regarding young children and their creative uses of technologies like the tablet. My understanding of digital natives is that they are inherently able to learn and use technology in powerful and meaningful ways. It was then assumed that the young children involved in this study would quickly learn how

to use the tablet as a drawing tool and then use the device to push their creative potential. Among this population of children the tablet was not recognized as a creative tool, and as such, its significance in terms of artistic development was minimal. In addition, the tablet and its use did not expedite children's artistic development, and in some situations, encouraged a temporary regression of ability in which participants would revert to a previous stage of artistic development during operation. As such, this observation disputes the claim that digital natives can naturally learn how to utilize technology in powerful ways. If this were the case, I would have expected children to demonstrate their true artistic tendencies with the tablet, if not create further detailed and perhaps even advanced renderings over time; a demonstration of true meaningful encounter. As this was not the case, I have begun to question the existence of digital natives who presumably use technology in powerful ways to enhance their own knowledge base. Observations from this study point to the need for significant time teaching and modeling in order for children to understand and embrace the tablet as a powerful creative tool.

While data from this study showed little evidence that the tablet could expedite children's creative growth, it is important to note that during the course of this research very little adult facilitation was employed when guiding young children what to draw, and how to create such imagery digitally. Occasional prompting was used when children appeared unmotivated or uninspired to work on the tablet, but I refrained from providing specific guidance on how to render with the tablet. The decision to proceed in this way was made because I wanted to observe how children naturally interacted with the tablet as a drawing tool. A classroom setting in which an art educator takes on a more involved instructional approach, providing specific exercises and definite prompts when drawing

on the tablet, may glean divergent observations. Within such a setting children might begin to create digital drawings that truly match their traditional counterparts. Perhaps even for some children, the tablet would help advance their artistic development further. Another explanation for this lack of significant artistic growth could be the short time span dedicated for this line of research. With a study period of only 15 weeks it is naïve to assume that children would undergo significant growth and development in this way. As such, only additional research could explore and perhaps confirm such hypotheses. Within the scope of the research, however, there seems to be a lack of evidence that today's presumed digital natives are capable of learning how to utilize tablets in truly productive and creative ways entirely on their own.

This brings me to a discussion of cultural change. Such a discussion is important as often the literature refers to technologies like the tablet computer as cultural change agents. To review, I define cultural change as a response to changes in perception, which in turn, impact cultural beliefs and values. As individuals encounter new sensory information, new concepts, new experiences, and new tools, our interpretations of the surrounding world and the behavior of others are modified. McFee (1970) describes this process as "identifying, sorting" (p. 253) and organizing information and experiences in ways that symbolize and record thinking. The impending academic question then is: how will tablets change the way we identify, sort, and organize our surroundings? In other words, will the tablet alter the way we see the world, the way we learn, the way we communicate, and the way we create? While it is undeniable that cultural change may indeed involve technology and technological advances, it will not be a product of only one particular tool like the tablet computer. Cultural change will instead occur as a

response to changed perceptions. Based upon data from this research, the children and adults who participated in this study currently perceive the tablet as a tool for play and associate its abilities with gaming. Even when asked to take part in action not often associated with gaming or play, participants continued to describe their experiences as such. This implies that among the participants the tablet is not considered a tool for learning, but instead for play. This is not to say that this current perception is unhealthy. Play and gaming serve important developmental roles and can make tedious learning motivating. Regardless, my suggestion is that until children and adults experience a shift in their perceptions and begin to see the tablet as a valuable learning instrument, in addition to a purposeful creation tool, serendipitous cultural change in academia will not occur as a result of the tablet computer.

This suggestion aligns with O'Sullivan (2000) who argues that, "rather than the technology driving change, technologies are human creations for human uses" and that "understanding people's motivations and goals, rather than the characteristics of a technology" (p. 55) will help us better predict its implications. Similarly, Salomon et al. (1991) believe that the benefits associated with using technology "are not likely to occur automatically as technologies advance" but "within the constraints of possibility and practicality" (p. 8). As such, "the effects of technology are what we choose to make them, and the responsibility of decision comes with the opportunity of choice" (p. 8). It is true that technologies like the tablet computer are influencing our classrooms, yet today's classrooms are not necessarily channeling the tablet as an effective learning tool. I am reminded of Piaget's constructivist approach to understanding young children in the preoperational stage of development who are exploring symbolic function. Based upon

the results of this study young children do not yet consider the tablet as a symbol of learning. Over time I believe this perception can evolve, but only when individuals can begin to conceptualize the objects and experiences they encounter in juxtaposition with their own learning potential.

With this in mind, I suggest that the classroom, and specifically the art classroom, continue to serve as an environment for true and meaningful educational encounter, particularly when it comes to technologies like the tablet. Martin (2011) writes that education and culture are constantly intertwined and that academia plays an important role in a type of metamorphosis involving a "process of change in which the capacities of an individual and the stock of a culture become yoked together" (p. 14). With the evolution of the information society and the continuous need for digital literacy, it remains increasingly critical that today's teachers expose children to appropriate uses of technology. Technology, in this way, serves an important role in individuals' cultural stock. Academia is in a position to consider this role and provide guidance regarding how technology can enhance personal potential. This research confirms that the tablet computer is motivating, exciting, and children enjoy interacting with it, yet the tool itself did not transform the classrooms involved in this study. It was regarded simply as a game, a device to play with, and something new to experience, rather than a serious artistic tool, at least in the minds of the children. Perhaps with time academia can attempt to yoke culture and individual capacity, and in turn, transform such perceptions regarding the tablet as a learning and creation tool.

Meanwhile, it is important to re-consider the assumptions of technology determinists. Based on results from this study I propose to dismiss titles like digital

native. While it might be true that today's younger generation may be more attuned to technological tools because they are surrounded by them, we should not imply that they have the ability and knowledge to use such tools in truly powerful ways on their own and without guidance. Meaningful learning, in the arts and beyond, must involve a variety of experiences and exposures to multiple sources of knowledge within the context of culture and our prospective communities. The field of education will continue to serve as the avenue to present and encourage such variety in experiences providing powerful and meaningful learning opportunities that help students come to their own perceptions of culture. With time and vast experiences I believe cultural change may occur, and that education can facilitate such change. Change can occur at a micro-level in which one classroom of students may take on varied perceptions of learning which, in turn, drastically change how and what they may learn. It can also occur at a broader level, impacting education at large. It remains difficult, however, to pinpoint when and how cultural change may occur in education, as it is associated with changed values and beliefs. Therefore, I propose, that instead of native and immigrant, we refer to ourselves as navigators of cultural change. I would define such navigators as anyone, regardless of age, living in an environment in which tools for accessing knowledge are regularly changing and becoming more broadly accessible. Navigators of cultural change represent a dynamic community of individuals with varied experiences and perceptions. As such, navigators of cultural change ask questions, explore possibilities, and challenge notions of acceptance when needed.

Tablets and Art Making

It is undeniable that we live in a society in which technology continuously penetrates every nuance of how we live and interact with one another. It is also true that individuals of all ages continue to be intrigued by technologies and their untapped power, particularly in the world of academia. This research illustrates the motivational power of technologies, like tablet computers, and children's desire to work with them. Considering this enthusiasm for such tools and the continuous push for digital literacy in schools, it is no wonder that schools are embracing devices like the tablet on a regular basis. Yet, this research implies that we cannot simply provide technology, like tablets, and expect children to utilize them appropriately, particularly as a tool for drawing and creative expression, individually or collaboratively. The art classroom is a good place to introduce and explore a tool like the tablet computer; however, the tool should not replace other traditional means of creation. Instead, I suggest that the tablet computer be considered one tool, among many media options, for artistic exploration. While the children in this study showed an exuberant interest in the tablet and its abilities, they still maintained an appreciation for crayons, paper, and the other media readily available in their classrooms. As such, educators, and specifically those who facilitate artistic experiences, must expose young children to all potential avenues for artistic exploration if available. Proactive educators can guide and facilitate important decision-making where each child chooses the best tool for their artistic message. Educators must model good practice with the tool including using it in meaningful, productive, and socially proactive ways.

In order to ensure such practice, adults must maintain an understanding of how children develop cognitively, personally, and morally, and how such development

influences children's perceptions and reactions to the tablet as a learning tool. From a social standpoint, adults must be aware that one way children learn is through observation. They must be acutely aware of how they present new media, like the tablet, how they design different learning opportunities, and how they facilitate learning spaces. How adults interact with young children in these ways, both verbally and nonverbally, can impact children's perceptions regarding content and tools. Kolbe (1993) writes that, "interaction between a child and an interested, responsive and involved adult, is essential." (p. 76). Perhaps because of the ways in which adults influenced children in this particular study young participants struggled in their perceptions of the tablet as a drawing tool. If adults wish to combat such perceptions and encourage creativity and exploration with the tablet computer it is important that they regularly reflect upon their own perceptions, as well as the manner in which they interact with young children. Such interactions can have major implications upon the ways children learn and how they perceive learning.

In addition to understanding children's cognitive, personal, moral, and social development, educators must maintain a thorough understanding of artistic development. The works of Lowenfeld and Brittain (1987), Hurwitz and Day (2007) and Kellogg (1969) encourage educators to provide students of all ages with a diverse art curriculum that exposes learners to various avenues of creation. Additionally, others in the field point to the undeniable importance of artful experimentation in an effort to help children find a sense of equilibrium between artistic stages (Hardiman & Zernish, 1980). Children are regularly "in awe of the physical qualities of art materials such as paint 'running,' color mixtures, and the changing colors of paint water" (Swann, 2005, p. 43). The same awe

must be considered when introducing young children to digital tools like the tablet. A thoughtful educator understands a child's need to push and press the tablet screen and move their finger in a rhythmic and kinesthetic way, playing with and experimenting with the media. Yet such an educator must also be equipped with the ability to support subsequent experiences that extend thinking and learning for the young learner. In the art classroom such supports are augmented by choice and variety in media and curriculum (Swann, 2005).

Providing a robust art curriculum, which embraces a variety of media, including the tablet computer, may also address concerns of novelty. I am reminded of the work of Bergin, Ford, and Hess (1993) who studied novelty effect in combination with technology integration in the kindergarten setting. The researchers found microcomputers to be "highly motivating;" however, "there was evidence of a mild form of novelty effect" in which "across time, high levels of interest were maintained, but expressions of this motivational pattern became less overt" (p. 443). Within the scope of this research the tablet itself was not novel, as many children had prior experience working with such a device or similar objects, like touchscreen phones. The novelty in this study involved the act of using the tablet as a learning tool, and specifically as an artistic tool. In the beginning children participating in this study enthusiastically approached the tablet as a drawing tool. Over time, however, this eagerness faded as participants requested experimentation with other tablet applications. These observations do not negate the work of researchers like Couse and Chen (2010) who qualified the novelty of tablets among young children, noting that participants "preferred to use the tablet rather than traditional" (p. 90) materials. Instead, it encourages those of us in the academic world to

evaluate regularly how these technologies are used and how they are considered among young children, in addition to how those perceptions may evolve over time in various instructional settings.

Art educators are in a unique and privileged position concerning this constant need for evaluation and reflection. As individuals versed in learning and instructional processes, as well as artistic development and practice, art educators can model effective and creative uses of technologies like the tablet computer. They are also in a position to house powerful discussions with children regarding such technological advancements and their influences on how we make art. Lankford (1986) writes of the significance of aesthetics as a process of "asking questions and searching for answers about the nature of art" (p. 49) It is also about "learning to accept… gray areas, living with alternative answers to single questions, viewing…with a critical eye, and making decisions based upon fairness of reasons, and experience" (p. 49). Today's art educators will benefit from taking such an approach while investigating the role of the tablet with their own students. To have a candid conversation with children asking questions and searching for answers, not only in regards to the nature of art, but the role of tablets in art, would reveal interesting sentiments.

Such an approach to aesthetic understanding was not unlike the methodologies used within this line of inquiry. When considering the perceived role of tablet computers in art making attempts were made to become a participant observer who questioned and analyzed the process of drawing digitally with a tablet, while also maintaining an open mind regarding external factors, unanswered questions, and diversified perceptions

among key players. I suggest a similar approach among researchers and art educators as we as a community continue to investigate the role of technology in creative endeavors.

Additional Recommendations for Future Research

There were several limitations to this particular research, which implies that there is more to explore when considering tablet computers and their role in artistic development. Several recommendations for further study are offered throughout this document. Additional recommendations are presented here for consideration among future investigators.

First, this study took place over the course of only one academic semester and accessed a very specific population of children, parents, and educators. As such, this study produced results that would be difficult to generalize among more diverse populations. Additional research could take on a longitudinal approach, following the same group of children over several years in which researchers might collect continued evidence of how the tablet may impact growth and artistic development. Several studies of this nature could be conducted among diverse communities of students, parents, and educators, representing various age ranges, communities, and socioeconomic groups.

It is also important to consider that this study was designed and executed with specific parameters and financial dimensions to ensure researcher focus and feasibility. For one, children's digital renderings on the tablet computer were only compared to children's traditional crayon drawings on paper. Children's tablet works were not compared to paintings, photographs, three-dimensional works, or the plethora of other options various media afford. Crayons and paper were selected because drawing with a crayon was one of the closest and more comparable experiences to drawing on the tablet.

Future research, which exposes children to various media, including the tablet, may shed additional light on children's media preferences, as well as how such preferences change over time and over the course of human development. Such studies may also speak to children's specific tool preferences within such media. For instance, while the children involved in this study failed to show interest in using a stylus to render on the tablet a future investigation which directly compares children's digital drawings made with a stylus to those made with their finger may produce interesting results concerning varied use of instrumentation.

Financial restrictions during this research involved the number of tablets accessible for study. Equipped with just one iPad® I worked one-on-one with each child participant, observing their interactions with the tool and recording their conversations. While this encouraged me to become fully immersed in every piece of data collected future investigations may tell a different story. Future studies might involve classrooms, specifically art classrooms, in which every child has access to a tablet computer.

Perhaps another financial dimension that limits the results of the research was the inability to print children's digital works of art. While each child received a CD and at least two hardcopies of their digital work during phase four of research I would be curious to see if providing paper copies of all drawings would alter children's perceptions of their tablet renderings. One of the major findings from this study was that children held their traditional crayons drawings in higher regard than their digital counterparts. Future research, in which printed copies of each digital art piece were provided, might document different perceptions among children.

A final recommendation for future research would be to replicate this study with a similar population of children and adults in five to ten years. Whether the tablet computer will still be considered a viable tool in the classroom is hard to predict as technologies are evolving at such an exponential rate, but if tablets are still being introduced and used replicating such a study may shed light upon how perceptions regarding the tablet as a drawing tool may have changed over time. While this particular population did not consider the tablet a drawing tool, nor did the tablet adequately demonstrate children's artistic abilities, perhaps this will change in the future.

Chapter Summary

Within this concluding chapter I have summarized and interpreted thematically how the results of this study provide answers to my original research questions. This has led me to several recommendations regarding tablets, their role in society, their role in education, and their potential influence on artistic growth. Yet, there is much to learn regarding these tools and their implications and many suggestions for future research were offered.

I close this chapter and this dissertation with a message to future researchers eager to learn more about tablet computers and their role in the classroom. It is true that "computers are everywhere. The versatile silicon chip has found a place in our homes, our schools, our work, and our leisure" (Winograd & Flores, 1986, p. 3). As technologies like the tablet computer continue to find a place in our culture, researchers and educators will be prompted to question the role such devices may play in learning and development. Adult and child participants taught me a lot about the tablet, its impact on learning, and its potential influences upon artistic growth. Education is experiencing a "flood of new

devices" and this research reminds us that we must be aware that technologies, like the tablet computer, bring "both benefits and dangers" (p. 3). It is undeniable that tomorrow's students must be informed of technology and keep up with its evolution. At the same time, we must maintain an investigative mindset when considering the appropriateness of tools, both digital and traditional. With time, perceptions regarding the tablet as a learning and as a drawing tool may change, transforming how individuals react and respond to the device in artistic and collaborative ways. In the meantime, whenever I find myself touring the technology department of the nearest superstore I will envision young hands and young minds at the helm of such tools and continue to wonder.

References

Alvarez, C., Brown, C. & Nussbaum, M. (2011). Comparative study of netbooks and tablet PCs for fostering face-to-face collaborative learning. *Computers in Human Behavior*, *27*(2), 834-844.

Anderson, R. (2006). *Digital ink and interaction in the classroom*. (Doctoral dissertation) Retrieved from Proquest. (304970675)

Barton, C. & Collura, K. (2003). Catalyst for Change. *The Journal*, *31*(4), 39-41.

Bayne, S. & Ross, J. (2007). The 'digital native' and 'digital immigrant': A dangerous opposition. In process. *Annual Conference of the Society for Research into Higher Education.* www.malts.ed.ac.uk/staff/sian/natives_final.pdf

Bennett, S. & Maton, K. (2010). Beyond the 'digital natives' debate: Towards a more nuanced understanding of students' technology experiences. *Journal of Computer Assisted Learning*, *26*(5), 321-331.

Bergin, D. A., Ford, M. E. & Hess, R. D. (1993). Patterns of motivation and social behavior associated with microcomputer use of young children. *Journal of Educational Psychology*, *85*(3), 437.

Boyatzis, C. J. & Albertini, G. (2000). A naturalistic observation of children drawing: Peer collaboration processes and influences in children's art. *New Directions for Child and Adolescent Development*, *2000*(90), 31-48.

Bruner, J. (1996). *The culture of education*. Cambridge, MA: Harvard University Press.

Bruning, R., Schraw, G. & Norby, M. (2011). *Cognitive psychology and instruction* (5th ed.). New York, NY: Pearson.

Caelli, L., Ray L. & Mill, J. (2003). 'Clear as mud': Toward greater clarity in generic qualitative research. *International Journal of Qualitative Methods, 2*(2), 1-24.

Cantor, J. H. & Cantor, G. N. (1964). Observing behavior in children as a function of stimulus novelty. *Child Development*, 119-128.

Carr, N. (2008). Is Google Making Us Stupid? *Yearbook (National Society For The Study Of Education)*, (2), 89-94.

Carr, N. (2010). The Juggler's Brain. *Phi Delta Kappan*, *92*(4), 8-14.

Cassidy, E. D., Colmenares, A., Jones, G., Manolovitz, T., Shen, L. & Vieira, S. (2014). Higher Education and emerging technologies: Shifting trends in student usage. *The Journal of Academic Librarianship*, *40*(2), 124-133.

Cordes, C. & Miller, E. (2000). *Fool's gold: A critical look at computers in childhood*. College Park, MD: Alliance for Childhood. Retrieved October 31, 2011 from http://www.allianceforchildhood.net/projects/computers/computers_reports_fools_gold_download.htm

Corbin, J. M. & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, *13*(1), 3-21.

Couse, L. J. & Chen, D. W. (2010). A tablet computer for young children? Exploring its viability for early childhood education. *Journal of Research on Technology in Education*, 43(1), 75-98.

Cummings, K. L. (2007). *Webs, windows, and reflections: Experiences in a secondary art classroom.* Retrieved from ProQuest Digital Dissertations. (AAT304852480).

Dweck, C. (1986). Motivational processes affecting learning. *American Psychologist, 41*, 1040-1048.

Efland, A.D. (1967). An examination of perception delineation theory: Some proposed modifications. *Studies in Art Education, 8(2)*, 66-86.

Efland, A.D. (2002). *Art and cognition*. New York, NY: Teachers College Press.

Eisner, E. (1976). *The arts, human development, and education*. Berkeley, CA: McCutchan.

Eisner, E. (2002). *The arts and the creation of mind*. Harrisonburg, VA: Donnelly & Sons.

Enriquez, A. (2010). Enhancing student performance using tablet computers. *College Teaching*, 58(3), 77-84.

Eraut, M. (Ed.). (1991). *Education and the information society*. London, England: Cassell Educational Limited.

Erikson, E. (1968). *Identity: Youth and crisis*. New York, NY: Norton & Company.

Feldman, D. (1994). Creativity: Proof that development occurs. In D. H. Feldman, M. Csikszentmihalyi & H. Gardner (Eds.), *Changing the world: A framework for the study of creativity* (pp. 85-101). Westport, CT: Praeger.

Fons, J. (2010). A year without paper: Tablet computers in the classroom. *The Physics Teacher, 48*, 481-483.

Freedman, K. (1995). Educational change within structures of history, culture, and discourse. In R. Neperud (Ed.), *Context, content, and community in art education: Beyond postmodernism*. New York, NY: Teachers College Press.

Gardner, H. (1973). *The arts and human development: A psychological study of the artistic process*. New York, NY: John Wiley & Sons.

Glaser, B. (1978). *Theoretical sensitivity*. Mill Valley, CA: Sociology Press.

Glaser, B. (1992). *Basics of grounded theory analysis*. Mill Valley, CA: Sociology Press.

Google. (2012). Picasso – draw, paint, doodle! Retrieved May 18, 2012 from https://play.google.com/store/apps/details?id=com.caramelizedapple.apps.Picasso&hl=en

Hahn, J. & Bussell, H. (2012). Curricular use of the iPad 2 by a first-year undergraduate learning community. *Library Technology Reports*, *48*(8), 42-47.

Hardiman, G. W. & Zernich, T. (1980). Some considerations of Piaget's cognitive-structuralist theory and children's artistic development. *Studies In Art Education*, *21*(3), 12-19.

Harwood, R., Miller, S. & Vasta, R. (2008). *Child psychology: Development in a changing society* (5th ed.). Hoboken, NJ: John Wiley & Sons.

Hurwitz A. & Day, M. (2007). *Children and their art: Methods for the elementary school* (8th ed.). Belmont, CA: Thomson.

Ivashkevich, O. (2009). Children's Drawing as a Sociocultural Practice: Remaking Gender and Popular Culture. *Studies In Art Education*, *51*(1), 50-63.

Karray, F., Alemzadeh, M., Saleh, J. & Arab, M. (2008). Human-computer interaction: Overview on state of the art. *International Journal on Smart Sensing and Intelligent Systems, 1*(1), 137-159.

Kellogg, R. (1969). *Analyzing children's art*. Palo Alto, CA: National Press.

Kohlberg, L. (1981). *The philosophy of moral development: Moral stages and the idea of justice*. New York, NY: Harper & Row.

Kolbe, U. (1993). Co-player and co-artist: New roles for the adult in children's visual arts

experiences. *Early Child Development and Care*, *90*(1), 73-82.

Korzenik, D. (1979). Socialization and drawing. *Art Education*, 26-29.

Kostelnik, M., Stein, L., & Whiren, A. (1988). Children's self-esteem: The verbal environment. *Childhood Education, 65*(1), 29-32.

Kostelnik, M., Whiren, A., Soderman, A. and Gregory, K. (2006). *Guiding children's social development: Theory to practice* (5th ed.). Clifton Park, NY: Thomson Delmar Learning.

Lankford, E. L. (1986). Making sense of aesthetics. *Studies in Art Education*, *28*, 49-52.

Lankford, E. L. (1990). Preparation and risk in teaching aesthetics. *Art Education, 43*(5), 50-56.

Li, S. & Pow, W. (2011). Affordance of deep infusion of one-on-one tablet-PCs into and beyond classroom. *International Journal of Instructional Media, 38*(4), 319-326.

Lowenfeld, V. & Brittain, W. (1987). *Creative and Mental Growth*. New York, NY: MacMillan.

Maninger, R. & Holden, M. (2009) Put the textbooks away: Preparation and support for a middle school one-to-one laptop initiative. *American Secondary Education, 38*(1), 5-33.

Mardigian, T. (n.d.). Young children and the technology trend: Toddlers and tablets unit. *Webroot*. Retrieved July 11, 2013 from http://www.webroot.com/En_US/consumer/articles/family-young-children-and-the-technology-trend-toddlers-and-tablets-unite

Margaryan, A. & Littlejohn, A. (2008). Are digital natives a myth or reality? Students'

use of technologies for learning. Retrieved May 18, 2012 from www.academy.gcal.ac.uk/.../DigitalNativesMythOrReality-MargaryanAndLittlejohn-draft-111208.pdf

Martin, J. (2011). *Education reconfigured: Culture, encounter and change*. New York, NY: Routledge.

Matthews, J. & Seow, P. (2007). Electronic paint: Understanding children's representation through their interactions with digital paint. *International Journal of Art & Design Education*, *26*(3), 251-263.

McFee, J. (1970). *Preparation for art* (2nd ed.). Belmont, CA: Wadsworth.

McFee, J. K. & Degge, R. M. (1977). *Art, culture, and environment: A catalyst for teaching*. Belmont, CA: Wadsworth.

McIntyre, M. (2002). *Start with the child: The needs and motivations of young people*. Retrieved May 18, 2012 from http://www.umiacs.umd.edu/~allisond/child_info_tech/Start-with-the-child.pdf

Merriam, S. (2002). Assessing and evaluating qualitative research. In S. Merriam (Ed.). *Qualitative research in practice* (pp.18-33). San Francisco, CA: Jossey-Bass.

Merriam, S. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Ormrod, J. E. (1995). *Education psychology: Principles and applications*. Englewood Cliffs, NJ: Merrill.

O'Sullivan, P. (2000). Communication technologies in an educational environment: lessons from a historical perspective. In R. Cole (Ed.), *Issues in Web-Based Pedagogy* (48-64). Westport, CT: Greenwood Press.

Parnell, W. & Bartlett, J. (2012). iDocument: How smartphones and tablets are changing documentation in preschool and primary classrooms. *Young Children*, *67*(3), 50-57.

Park, B. (2006). The science of learning meets the art of teaching. *Education Canada*, *46*(4), 63.

Piaget, J. (1936). *The origin of intelligence in the child*. New York, NY: Penguin Books.

Piaget, J., & Inhelder, B. (1956) *The child's conception of space*. London: Routledge and Kegan Paul.

Picard, D., Martin, P., & Tsao, R. (2014). iPads at school? A quantitative comparison of elementary schoolchildren's pen-on-paper versus finger-on-screen drawing skills. *Journal of Educational Computing Research*, *50*(2), 203-212.

Poppenk, J., Köhler, S. & Moscovitch, M. (2010). Revisiting the novelty effect: When familiarity, not novelty, enhances memory. *Journal Of Experimental Psychology: Learning, Memory, And Cognition*, *36*(5), 1321-1330.

Prensky, M. (2001). Digital natives, digital immigrants. *On The Horizon*, 9(5), 1-6

Prensky, M. (2009). H. sapiens digital: From digital immigrants and digital natives to digital wisdom. *Innovate 5*(3). Retrieved May 18, 2012 from ww.wisdompage.com/Prensky01.html

Prensky, M. (2010). *Teaching digital natives: Partnering for real learning*. Thousand Oaks, CA: Corwin.

Prensky, M. (2012). *Brain gain: Technology and the quest for digital wisdom*. New York, NY: Palgrave Macmillan.

Rivoltella, P. (2012). Beyond digital natives: European research on media education;

challenges and technology and pedagogical issues. *Educational Technology*, *52*(2), 25-29.

Rose, S. W. (2003). The relationship between Glasser's Quality School concept and brain-based theory. *International Journal of Reality Therapy*, *22*(2), 52.

Ryan, R. & Deci, E. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25,* 54-67.

Salomon, G., Perkins, D. & Globerson, T. (1991). Partners in cognition: Extending human intelligence with intelligent technologies. *Educational Researcher*, 20, 2-9.

Schedeen, J. (2010). *The history of the tablet PC: We explore the long history of tablet computers, from the Penpad to the iPad*. Retrieved May 18, 2012 from http://www.ign.com/articles/2010/04/01/the-history-of-the-tablet-pc

Shifflet, R., Toledo, C. & Mattoon C. (2012). Touch tablet surprises: A preschool teacher's story. *Young Children*, *67*(3), 36-41.

Spector, J. (2008). Cognition and learning in the digital age: Promising research and practice. *Computers in Human Behavior*, 24, 249-262.

Stanulis, R. N., & Manning, B. H. (2002). The Teacher's Role in Creating a Positive Verbal and Nonverbal Environment in the Early Childhood Classroom. *Early Childhood Education Journal*, *30*(1), 3-8.

Sternberg, R. (2002). It's not what you know, but how you use it: Teaching for wisdom. *Chronicle of Higher Education, 48*(42), B20.

Stetsenko, A. (1995). The psychological function of children's drawing: A Vygotskian

perspective. In C. Lange-Kuttner and G.V. Thomas (Eds.), *Drawing and looking* (pp. 147-158). New York, NY: Harvester Wheatsheaf.

Svinicki, M. (2004). *Learning and motivation in the postsecondary classroom.* San Francisco, CA: Anker.

Swann, A. (2005). The Role of Media and Emerging Representation in Early Childhood. *Art Education*, *58*(4), 41-47.

Tapscott, D. (1998). *Growing up digital: The rise of the net generation*. New York, NY: McGraw-Hill.

Technology. (n.d.). In *Dictionary.com*. Retrieved May 18, 2012 from http://dictionary.reference.com/browse/technology?s=t

Thompson, C.M. (1999). Drawing together: Peer influence in preschool-kindergarten art classes. *Visual Arts Research, 25*(2), 61-68.

Thompson, C. M. (2003). Kinderculture in the Art Classroom: Early Childhood Art and the Mediation of Culture. *Studies In Art Education*, *44*(2), 135-146.

Tudge, J. R. (1992). Processes and consequences of peer collaboration: A Vygotskian analysis. *Child development*, *63*(6), 1364-1379.

Vygotsky, L. (1971). *The psychology of art*. Cambridge, MA: M.I.T.

Vygotsky, L. (1998). *The collected works of L.S. Vygotsky: Vol. 5. Child pyschology* (M. Hall, Trans.). New York, NY: Plenum. (Original works published 1896-1934)

Wallace, D. & Witus, A. (2013). Integrating iPad technology in earth science K-12 outreach courses: Field and classroom applications. *Journal Of Geoscience Education*, *61*(4), 385-395.

Warschauer, M. (1999). *Electronic literacies: Language, culture, and power in online*

education. Mahwah, NJ: Lawrence Erlbaum.

Wilson, B. & Wilson, M. (1977). An iconoclastic view of the imagery sources in the drawings of young people. *Art Education*, *30*(1), 4-12.

Winograd, T. & Flores, F. (1986). *Understanding computers and cognition: A new foundation for design*. Norwood, NJ: Ablex.

Woolfolk, A.E. (1998). *Educational psychology* (7th ed.). Boston, MA: Allyn & Bacon.

Zucker, A. & Hug, S. (2007). A study of the 1:1 laptop program at the Denver school of science & technology. Retrieved May 18, 2012 from www.projectred.org/uploads/DSST_Laptop_Study_Report.pdf

Appendix A: Interview Study

Introduction

It was during the Fall semester of 2012, while accumulating historical and contemporary literature supporting my research endeavors, that I was advised to conduct a small interview study prior to beginning the dissertation process. Such a study was designed in order to decipher what leaders in the fields of education felt about the educational implications of tablet computers and to provide valuable contextual information for my dissertation. This preliminary interview study was framed by two questions:

1. What are leaders in the fields of education saying about tablet computers and their implications in the academic setting?
2. What are leaders in the fields of education saying about tablet computers and their influences on children's natural artistic tendencies?

A basic qualitative study was designed for the purpose of this preliminary investigation. An interview protocol was developed as the primary means of data collection in which I asked adult leaders in the fields of education and art education questions regarding tablet computers and their implications for learning.

Participant Selection and Sampling

Participants represented researchers and practitioners. Those who published or presented regularly on the topic of tablet computers and their influences in the classroom were considered for this research. I looked to various sources for contacts. This included major publication databases like ERIC, major field organizations like the National Art

Education Association, suggestions from participants, in addition to previously established connections. Upon receiving IRB approval I reached out electronically to selected leaders through purposeful sampling. In total, seven responded to my email inquiry.

Participants included, and are listed in the order in which they were interviewed; Tricia Fuglestad, art teacher at Dryden Elementary School, Dr. Leslie Couse, Associate Chair of the Education Department and Associate Professor of Education at the University of New Hampshire, Dr. Roberta Schomburg, Associate Dean and Director of the School of Education at Carlow University, Dr. Diane Gregory, Director of Undergraduate and Graduate Studies in Art Education and Associate Professor of Art at Texas Woman's University, Dr. Joanna Black, Associate Professor of Art Education in the Faculty of Education and Associate Professor in the School of Art at the University of Manitoba, Dr. Rena Shifflet, Assistant Professor in the Department of Teaching and Learning and Assistant Professor in the Department of Elementary Education at Illinois State University and Dr. Guey-Meei Yang, Associate Professor of Visual Arts Education at Eastern Michigan University.

Instrumentation

After one week to consider their involvement and to ask any pending questions participants were scheduled for an interview. All interviews were arranged to take place between the fall semester of 2012 and the spring semester of 2013. Arrangements were made with each participant via email to schedule a date and time that would work best for their busy schedules. It was not possible to arrange in-person interviews because of geographic restrictions and timing. Contact was made via phone or Skype® technology,

and interviews were recorded with a digital voice recorder. Interviews ranged between one half hour and one full hour. Following each interview, detailed transcriptions were typed and saved electronically.

The following semi-structured protocol was used in order to frame discussion:

1. We have seen a rise in educational institutions adopting the tablet computer (like the Apple® iPad®) as a tool. Do you see the tablet as a catalyst for change in education?
2. Do you feel some levels of education are more prepared to accept the tablet as a tool than others? For instance, Kindergarten verses university?
3. In what ways can tablet computers enhance the learning process (may also be answered through question one)?
4. In what ways can tablet computers impede the learning process?
5. I am primarily interested in looking at tablet computers and their implications on children's natural artistic tendencies. Do you feel tablet computers have the ability to challenge students beyond their natural artistic inclinations?
6. Considering my curiosities and research interests, are their any other key figures you believe I should interview to acquire further knowledge in this domain?

Data Analysis

Following the transcription of each interview I coded qualitative data following a constant comparative method. Such a method was borrowed in an effort to immerse myself within the data. I practiced open and axial coding throughout the research experience. Immediately following transcription I openly coded key terms regularly used

by participants. Terms included, but were not limited to, tablet, computer, art materials, learning, mobility, ease, comfort, and price. Once all transcriptions were complete, axial coding commenced, and categories were developed in an effort to label reoccurring observations. Categories included (1) comparing the tablet to other media, (2) the tablet's benefits and (3) the tablet's hindrances. Subcategories were developed, as well as properties and dimensions to define observations further. Two subcategories were formed when comparing tablet computers to other media. Some participants compared tablets to traditional computers. Some compared tablets to traditional art media. A second group of subcategories focused on the benefits of the tablet computer. Participants noted that the tablet computer was a multitasking tool, it was mobile and it was easy to use. The third group of subcategories focused on limitations of the device. Some participants noted its mobility as a hindrance, as well as the financial commitment involved. Others brought up the varied comfort levels of children and adults as well as the need for training as additional hindrances. Selective coding was not practiced for this brief interview study, as my intentions were not to hypothesize or propose a core category. My intention, instead, was to collect the perceptions of others to further inform myself on the current discussions circling tablet computers in academia. Table 1 illustrates the categories, sub-categories, properties and dimensions developed during analysis of this data.

Categories	Sub-Categories	Properties	Dimensions
The tablet versus other media	Tablet versus the computer	Characteristics	Benefits and limitations
	Tablet versus traditional art materials	Characteristics	Benefits and limitations
Benefits of the tablet	Multitasking tool	Capabilities	From small to extreme
	Mobility	Capabilities	From small to extreme
	Ease of use	Usability	From easy to difficult
Limitations of the tablet	Mobility	Challenges	From small to extreme
	Comfort level	Demonstration of prior knowledge or attitude	From high to low
			Among preschool through adult
		Need for training	From high to low
	Financial standpoint	Manufacturer control	From money to influence

Table 1. Categories, Sub-Categories, Properties, and Dimensions

Role and Placement of the Researcher

My role in this research was to collect valuable insights from participants through semi-structured interviews. As an educator and as an emerging researcher I was equipped with the vocabulary and content knowledge to relate to each of my participants in some way. While such experience and knowledge afforded me the confidence to speak with leaders in the education fields I was exploring, I also understood that such a lens could threaten the reliability of my study. With this, efforts were made to negate issues of researcher bias.

Researcher bias.

Concerns of researcher bias arose throughout the research experience, and particularly during participant selection, while conducting interviews, and during data analysis and interpretation. In order to prevent issues of researcher bias, several measures were taken. First, efforts were made to identify participants who were termed experts in tablet technology by others in their fields, and not simply by my own definition. When I researched potential participants I looked at how often they published and/or presented their findings regarding tablets. I also considered how often they were cited by others in the field. I shared my list of potential participants to faculty mentors to ensure participation was focused, yet diverse in terms of professional experiences. Second, efforts were made to conduct regular member checks to ensure that interview and subsequent data analysis was accurate. During interviews participants were informed that because of their role within their prospective fields, their identities would be revealed alongside selected quotations to further substantiate opinions regarding tablet computers. After a preliminary write-up of findings was prepared, I shared my overarching discussion with each participant along with their quoted contributions. Participants were then given time to re-script any statements they wished and critique my interpretation of the data to ensure that my voice was minimal during the interview process. Finally, I presented my work to a series of peer reviewers to test for concerns of researcher bias. External reviewers were provided anonymous copies of transcripts alongside an initial draft of findings stripped of participant names. External reviewers were trained to recognize issues of researcher bias and to ensure my interpretations aligned with participants' statements.

Reliability and validity.

Several steps were taken to ensure the trustworthiness of this study. I made efforts to clearly state my purpose prior, during, and following access to my participants. Additionally, I identified early on my own personal perspectives of the problem, and considered my own assumptions and biases regarding tablet computers in the classroom space. Finally, a private journal was established in order to make notes regularly and create an audit trail of my regular reflections, analytic memos, and considerations regarding methods. During final write-up, I made an effort to openly share with readers my purpose, my tools for inquiry, and my methods of meaning making. To address concerns of internal validity, additional peer examination was practiced. Final analyses were shared regularly with a fellow doctoral student and mentors to ensure clarity in my writing and interpretation.

Limitations

There were several limitations associated with this research. First, only seven educators participated in the interview study. With such a small number of participants, it is difficult to generalize study results. Second, the study took place over the course of one academic semester. It is difficult to say if this was an adequate amount of time to divulge significant findings regarding the tablet computer as a learning tool. Ideally, this study would have expanded several years and accessed a variety of educators from different fields, documenting their evolving opinions regarding the tablet as a learning tool. A third and final limitation to the study involves the primary data collection instrument, the researcher. As the collector and analyst of chiefly qualitative data, it was a tremendous responsibility to maintain accurate and trustworthy records of interpretation. Such a study

would have benefited from having a team of researchers that could regularly converse and triangulate data.

Findings

Following description of the methodology used for this preliminary study, I share my findings and interpretations of collected interview data. The following reports how participants compared the tablet to computers at large, how they compared the tablet to traditional art materials, and the perceived benefits and limitations of the tablet in an academic setting.

The tablet versus the computer.

When asked about the tablet computer and its implications in academia participants were quick to share their insights and experiences. With the rapid evolution of tablets society has seen a wave of consumers utilizing such devices in very similar ways as their desktop or laptop counterparts. They are often seen as web surfing tools which, in the classroom setting, have the ability of transporting children to new and exciting places. Researchers like Dr. Roberta Schomburg have recognized this capability. She said:

> Tablets and probably computers in general have the capacity to bring into children's worlds virtual experiences that they wouldn't otherwise be able to experience. So that they can see a zoo, or zoo animals up close…in a way that they might not be able to in real life. Now that's not to say that this should replace the real experiences, but there are some things that just aren't possible. (transcript, 11.28.2012)

But what makes these compact tools dramatically different from desktop or laptop computers? When asked about the power of tablet technologies, elementary art teacher, Tricia Fuglestad noted that,

> They are easy to put in children's hands, unlike the laptop [which] teachers weren't giving to students to go walk around the room with…this is a camera, you can make videos, you can draw on it, you can animate, tell stories, you can Skype®, you can look at maps, you can have augmented reality experiences, you can zap qr codes and get new information…they are meant to be discovery devices and our students are roaming the hallways…learning new things. (transcript, 11.12.2012)

This idea of packing all of the strengths of a computer into one small device was a common perk among interview participants. In fact, many participants, when comparing the tablet computer to a desktop or laptop noted the tablet's uncanny ability to simplify overly complex tasks. Dr. Guey-Meei Yang stated that, "a tablet can do multimedia tasks much easier than a computer and other electronic tools combined…it's simple, appealing, and powerful because it's just one small device that integrates many software and hardware together" (transcript, 2.18.2013). Such comments encourage another pressing question: why is simplicity so appealing? Schomburg noted that,

> One of the things young children struggle with, in terms of computers, is moving a mouse and having something move on the screen where there isn't a good connection between what they're moving and what's happening. And similarly most preschoolers are not that adept at keyboards…they hit the keys but they don't necessarily know what the relationship is to a screen. Well, tablets came

> along and all the child has to do is touch it and it moves…it's really taken out the intermediate steps that many children took a while to figure out. (transcript, 11.28.2012)

Taking out such "intermediate steps" and simplification has impacted classrooms like Fuglestad's. When speaking about the complicated software Photoshop®, Fugelstad noted how complex and difficult it was for her students to use such programs on a traditional desktop or laptop. Yet, when presented with the tablet version of a similar program, known as Sketchbook Express®, students quickly began to understand complex graphic design concepts like layers and brushes. Fuglestad described such a phenomenon at length and the excitement it brought to her art classroom space:

> I have never really tried to work with layers with students on a laptop because… it had too many buttons, too many confusing things and everything was just too new and we would have spent the entire class period just trying to understand the concept of layers and then barely have any time to make art. So I gave up trying to teach students layers…and went with other ways of doing graphic design with students…but on the iPad®, the interface was so simple that I could do it. Not only could I do it, but I could do it with the really little ones. I did a project with layers with first grade last year and…I was really excited…This is earth shattering! (transcript, 11.12.2012)

With this, it seems that the tablet computer can potentially scaffold learning for children simply through its own ergonomic and user-friendly design. By presenting information and software in a less intimidating way and with more simplified terms the tablet serves as a valuable tool for beginning learners as compared to desktop or laptop computers.

Similar thoughts regarding the simplification of tasks and approachable nature of tablet technologies were noted when participants compared such a tool to traditional art media. The following section details those insights as well as other thoughts concerning artistic production.

The tablet versus traditional art media.

When asked about the tablet computer and their possible implications in the art classroom space overwhelmingly participants noted the importance of presenting such a tool as one of a variety of artistic options, and one that should not replace traditional materials such as pencils and paint. Dr. Leslie Couse put it well when she pointed out the following:

> Think about the earliest kinds of drawings and etching that happened, like with the caveman, drawing in the sand, you pick up a stick and you draw or you pick up a rock and you etch it and you find these things on the side of a cave. So from a sociologic perspective and evolutionary perspective [this] really got me thinking relative to that and the whole idea of fine motor skills and in early childhood, we expose children to a range of opportunities for creativity and a range of experiences…We aren't throwing markers out. We aren't saying don't do all those wonderful traditional things like finger painting, those still have a place. We just need to consider this other option that we haven't historically had. (transcript, 11.14.2012)

Similarly, Dr. Joanna Black stated that,

> The foundation always has to be the traditional arts. And that is the basis from which any technology should be used. Having said that I think that a pencil, a

> mere pencil, is a form of technology. So what I'm saying here then is that the traditional technologies are the foundation and that the traditional best practices approach are the key to utilizing the new technologies including the iPad© technologies. (transcript, 2.8.2013)

This idea of maintaining respect for other traditional art materials was paramount among participants. Still, a few expressed additional reasons for utilizing the tablet in an artistic setting.

A major benefit of the tablet, compared to other art media, is the ability to quickly and easily fix mistakes. Fuglestad noted that "there are lot more ways to fix your problems when you're drawing on an iPad®" (transcript, 11.12.2012) and that students can easily work back a few steps, resize renderings or even erase large areas without the risk of pressure marks. Couse mirrored this sentiment, and further noted how liberating this sense of control and power is for children:

> They could just hit the undo button and it's gone…that was really freeing for some kids once they discovered that. Once they got the idea that I didn't like that, but I don't have to stay with it. I can make it gone and when I erase on paper I still see the smudges, but they didn't see that on the tablet which was really nice. So it was freeing for kids in that perspective. (transcript, 11.14.2012)

Yang agreed that the tablet was an approachable tool for young children. She also described the tablet as a means of recording progress over time.

> You cannot possibly be with every student in the classroom from the beginning to the end of their drawing processes. With an app like Brushes® you can record their entire process. You can then show them their process to facilitate a

> reflection—what they did well and what they could have done differently. You could also compare different students' drawing processes and allow them to learn from each other. (transcript, 2.18.2013)

For Yang the tablet can be used to document progression in learning while also serving as a space for brainstorming and experimentation. In this way the tablet is seen as a seemingly living, breathing sketchbook of sorts that can augment overall artistic growth and development.

While there are benefits to using the tablet computer in an art classroom setting there are also limitations. Couse made an interesting point when she stated, "I would wonder if it has the capacity to do what (the students) really want to do with the media – medium, because you know it's limited, it's just two-dimensional, it's flat" (transcript, 11.14.2012). For Couse such limitations stem from the initial development of tablet applications. Couse noted that, "right now (children) are dependent on what the programmer says it can do and it's capacity. And so someone else is dictating that. So to me, that already sets some kind of limitation on their naturalistic creative ability" (transcript, 11.14.2012). Such concerns regarding the design of tablet programs bring to light issues of true artistic freedom. While comparing tablets to traditional computers participants liked that the tablet was more simplistic and approachable, giving children a sense of control and power. Yet here, and in discussions regarding art, concerns of freedom arose among interviewees.

Another concern was addressed by Schomburg, who stated, "I think there is something about the sensory process related to art that students would gain that they wouldn't gain from a tablet" (transcript, 11.28.2012). Here Schomburg referenced the

fact that the tablet is a flat, two-dimensional media for which children react to differently when compared to perhaps clay or other sculptural material. Dr. Diane Gregory shared this sentiment when she noted the primary difference between the tablet and traditional media. She stated that, "the real difference is that it is virtual and not sensory – and you're going to get a lot of push back on that. You are going to get some people that say you can't touch it, you can't smell it" (transcript, 1.28.2013). Regardless of whether or not children are exposed to tablets in an artful way, participants seemed to agree that a certain exploratory period must take place in order for children themselves to conceptualize the possibilities of tablets in the art classroom. As Schomburg pointed out,

> Look at how children use any materials. They tend to go through what we call a scribbling stage when they are just engaged in sensory stimulation of it – any new material. Now that goes faster and faster as they have more and more experience and as they're older, but the first time we give them sand, it's just woosh! And they're just playing around with it, and after they've had more experiences they start doing something with it. And it's the same with clay and it's the same with play dough and it's the same with graphic materials. But I hadn't thought about it as needing to go through the same stages with the tablet because we think of it as being the same as paper essentially, and yet it is not. It has a different feel, they have to explore it, they have to explore with the movements before they can actually draw. (transcript, 11.28.2012)

Such a statement supports years of developmental research detailing the stages children undergo when learning, which may shed additional light on the ways in which

technologies are embraced by learners of all ages. Additional research in this domain would prove enlightening.

Additional benefits of the tablet.

Following previous discussion regarding the tablet as compared to other media I continue with additional benefits of the tool, and specifically in regard to learning. Such discussion is situated among participants' comments.

One of the great benefits of the tablet computer, expressed by participants broadly, is its ability to facilitate several different types of activity. Fuglestad listed the numerous ways her students utilize the tablet as a still camera, a video camera, a sketchbook, an animation tool, a storytelling tool, a communication device and so on. Similarly, Schomburg (transcript, November 28, 2012) shared a wonderful scenario in which only the tablet could facilitate each step of a seemingly complicated process:

> So children can go and take photographs of the caterpillar they're seeing, and then they can come back, load it, scan it to a computer or printer – you know, come inside, print it off the iPad®, dictate a story which then is printed along side [and] make books.

This idea of using the tablet and its various tools to create a unified product was exciting to all participants in this study.

In addition to offering many tools in one compact device, the tablet is mobile, given its slim and wireless nature. Fuglestad noted that because of these physical attributes the tablet puts "the learning in students hands in a different way than it's been before" (transcript, 11.12. 2012). This mobility is equally exciting for Dr. Rena Shifflet who pointed out that,

> You can take them anywhere, they are so portable. So you can go outside on a walk and you can find pictures of the bugs that they're seeing and the teacher can read about them – show them pictures of a caterpillar and what it looks like when it comes to chrysalis and then a butterfly, so you can sit down right there while they're looking at a caterpillar and have a conversation about what's going to happen to this caterpillar over time. I think because it's so portable it affords itself more accessibility as a resource tool. (transcript, 2.12.2013)

Some hypothesize that this mobility can drastically change education and the way we learn at large. Case in point, my interview with Gregory, who noted how the tablet computer can extend learning beyond school hours:

> The current paradigm in education is that you don't learn anything until you go to school. And we don't learn art until 2:00 in the afternoon when it's scheduled. It's just really frustrating, it needs more flexibility and that's what I was talking about – being mobile. So same time, same place…we can move education into that kind of flexibility. (transcript, 1.28.2013)

This challenges traditional notions of education, when it occurs, and under what stipulations. According to participants tablets provide students a sense of power and ownership in learning, and that by placing the tool in the child's hands, they have the potential to transform their own learning process and make it entirely unique to their inherent interests and needs. This, according to participants, is a potentially exciting by-product of technologies like the tablet computer.

A third benefit of utilizing the tablet computer is its ease of use. Many of those interviewed noted how easily children access and operate the device. Couse, when

reflecting on her prior research with tablet computers, noted how "kids actually persisted and didn't get frustrated" (transcript, 11.14.2012) when the technology did not work as expected. Schomburg also mirrored this sentiment when she stated that, "the technology is such that they touch it and something happens. They don't have to know how to pull the cord. If they touch it something happens." (transcript, 11.28.2012) It is true that even the youngest of children seem able to use a tablet with little instruction.

Some participants also believe that the tablet encourages dynamic and collaborative learning among children. Gregory made the following plea:

> There needs to be a social part of it. So many times I've been concerned about the isolation that can occur when somebody begins to think of it (the tablet) as a game or a toy and they just want to be alone, do it on their own. I would like to see kids work in partnerships on it and sharing with each other so that it becomes a social learning tool. And, so they can talk about the art with other kids their age, talk about their own art, even create an online gallery. (transcript, 1.28.2013)

Some participants have witnessed firsthand children coming together socially as a result of this particular tool. Case in point, Shifflet who described some of her prior research with tablets in an early childhood setting.

> If you let students draw on the easel with whatever medium you want or with paint it's their space, it's their space, it's their drawing, but when they have the tablet it's not mine, it's ours. They collaborated and I don't think that was the intent. I don't know how it was initiated, they just did it and they went to show the teacher and it became this is what we did. So there was a definite collaboration and acknowledgement of that collaboration. (transcript, 2.12.2013)

Based upon these statements the tablet computer can enhance collaborative experiences when facilitated in meaningful ways.

According to participants the tablet offers a variety of tools, is entirely mobile, easy to operate, and promotes collaborative experiences. It is because of these benefits that the tablet is presumed to transform education at large. Yet, there are also perceived limitations to the device discussed in the pages following.

Limitations of the tablet.

While a noted benefit, mobility was also perceived as a limitation among participants. Fuglestad, a promoter of tablet usage, expressed a surprising concern for her young students:

> [One] thing that could go wrong in our school is working on our network so that we can handle all the iPads® that could be on at any one given time in the building, and because that's new and it poses new challenges and we're just trouble shooting it all on the fly. So (for instance) I'm working with twenty different kids and they all need to email me their artwork at the end but half of them can't get on the network. If they leave the room and I don't have their artwork, there's nothing to show for it. And kids are accidently deleting things because they haven't learned yet what's proper on the iPads® so it's all a learning process for the teachers and the students – how to work through all these issues with shared iPads®. (transcript, 11.12.2012)

Similarly, Black mirrored this concern regarding mobility when she noted, "it's limited, because you have to share it. You would have to pass the tablet to different people"

(transcript, 2.8.2013). This concern becomes very real in an educational setting in which a limited number of tablets are available for widespread use.

Such a concern for sharing devices and making sure they are available to as many children as possible brings to light a second hindrance, financial in nature. While such devices become more and more competitively priced on a daily basis, they are still a large investment for schools. For some schools it may be impossible to support a one-to-one initiative. Some participants brought up the concerning issue of fostering a digital divide among children. For instance, Shifflet, who poignantly noted,

> It's not about letters and numbers anymore. We want you to be reading in kindergarten. Knowing your letters and numbers, you need to have that before you come into kindergarten. So it's going to be the haves and the have-nots. Those that have these kinds of technology tools will know so much more just intuitively, because their parents are loading those apps – it's not going to be long. And the ones that don't have access to it, it's going to be harder for them to meet those expectations when they come into school. (transcript, 2.12.2013)

Similarly, when asked whether or not tablets can impede the learning process, Yang stated, "I would say they certainly can create additional divide because you enable certain students or classrooms to have access to tablet computers and that can create further divide" (transcript, 2.18.2013). Beyond concerns of sharing and affording such devices, other pending issues concern comfort level among key players and the dire need for training prior to implementation.

While most participants noted how easy it was for younger students to adapt to the tablet computer, this is not always the case for adult learners. Shifflet went so far as to

describe adults as "very leery of using technology for instructional purposes because they don't understand some of the applications of it, they're afraid it's going to break and a lot of them are afraid that they will look foolish" (transcript, 2.12.2013). Such concerns apply to those adults going into the field of teaching. Fuglestad, who has mentored several student teachers during her tenure, echoed similar thoughts. "A lot of my student teachers come to me not thinking about how technology is useful in education. They come with some sort of disconnect" (transcript, 12.12.2012). Whether such a disconnect is associated with the popularly published divide between digital immigrants and digital natives remains unclear at this time. What is clear, based on participants' responses, is that in order for any change to occur adults must be exposed to such technologies and become comfortable with their usage. Couse makes some assertions in the following quote that could have great implications upon education at large.

> In early childhood we've resisted this idea of technology for a long time. Because we think of children engaging in technology the same way adults do. I'm going to sit at the computer, and I'm going to work for hours on end and my eyes will hurt and my brain will hurt and my body will say, ugh I can't stand up. And that's just not the ways kids engage with technology, and we've known that for a long time. (transcript, 11.14.2012)

Such a claim suggests that it is necessary to re-educate and re-train adults and children alike of the appropriate use of such technologies in an educational setting. This may be considered a hindrance because of the added time needed for such preparation. There is also the impending risk of teachers using such tools without seeking proper training, which could inevitably impede learning. Couse put it nicely when she stated that,

> Adults have to be engaged and we have to be part of the learning process with children because we have to be thinking about why we are using it, what's the purpose of this, what's the child gaining and how can I challenge them, so being able to put limits on it. So it's not just a free for all. There's still very much a role for adults and active decision making in terms of how we use technology as a tool. (transcript, 11.14.2012)

The role of the educator continues to be a facilitator and guide for learning, whether that individual has a tablet in their hand or not. If a tablet is accessed, caution must also be practiced. Shifflet emphasized the fact that educators should not use technologies simply because they are engaging and motivating to learners. She said,

> The design of instruction is always the most critical. It's the purpose for the tool. So if we can do it better with 20th century stuff, then do it that way. Technology is supposed to enhance, it's not supposed to just be there because it's cool, it's neat. It's there to help students do what they typically can't do. So I think in that respect the misuse of a technology tool is more impeditive than anything. (transcript, 2.12.2013)

Educators must use a selected tool because it can enhance learning, not because it is simply deemed cool or new to users.

With critical concerns regarding mobility, financial commitment, comfort level, and the need for training looming, is it possible for tablets to have a positive impact upon education? Regardless of such concerns, participants in this study remained optimistic regarding the tablet and it's potential impact on learning. For this group of individuals it seems the benefits of the tool far out weigh the risks. Such benefits include multiple

capabilities, mobility, ease of use, and presumed social power. Together, such benefits allow the user a greater sense of control over media.

Concluding Remarks

In the end this preliminary interview study served two purposes. First, it afforded me valuable experience in research methodology. It encouraged me to explore a topic of interest while practicing new skill-sets. Second, this exploration provided insights regarding the ways tablets are perceived among a select population of educators. For this group of individuals the tablet is seen as a powerful tool, which can potentially scaffold learning, extend the normal learning period, engage children in collaborative learning opportunities, and more. From participants' statements it is presumed that the tablet can potentially enhance learning in significant ways. While this study was small and exploratory in nature, it was informative for a beginning researcher. As such, the findings from this research are difficult to generalize and the fields of education and art education will undoubtedly continue to explore such a tool and its relevance in the classroom environment. For this researcher this initial investigation represents the start of many future explorations to come.

Appendix B: Educator Consent Form and Informational Letter

Informed Consent for Participation in Research Activities

A Tablet Computer in an Early Childhood Setting: A Qualitative Study

Educator/Participant's Name: _____

Principal Investigator: Sarah Cress, Doctoral Candidate in the College of Education, GTA in the Department of Art Education

1. **You** are invited to participate in a research study conducted by Sarah Cress under the supervision of Dr. Louis Lankford. The purpose of this study is to look at how tablet technologies can be utilized during art making experiences. You and your students have been selected because of your association with the [redacted] Child Development Center. The aim of this intervention is to add to the literature concerning technology usage during the pre-school years. This research may provide significant light on tablet computers and their implications for learning. Please read this form and ask any questions you may have before consenting to this collection of data.

2. a.) Your participation as an **educator** will involve

- Completion of one brief survey. Data will be collected in the form of short written responses. This survey may be returned to the researcher along with this signed consent form.
- Weekly observations in which the researcher will visit the classroom and observe you and your students in action. These observations will average once weekly for the first three weeks of study. Data will be collected in the form of observational field notes and analytical memos.
- At least one interview, lasting approximately thirty minutes, or one focus group discussion, lasting approximately one hour, in which you will share your unique opinions regarding tablets in the preschool setting. Audio recordings will be collected from interviews or focus group discussions.

Your **students'** participation will involve

- Opportunities in which your students can work one on one with the researcher making digital drawings on a tablet computer, along with some with crayons on paper. These visits will average once weekly, ten minutes per visit for up to six weeks. Digital drawings, scanned copies of drawings made with crayons on paper, audio recordings of your students speaking during the art making process and video recordings featuring the back of your students' heads, their hands and the researcher, as your students draw on either paper or a tablet will be collected.
- Opportunities in which your students can work collaboratively with a peer creating drawings on a tablet computer together. These visits will average once weekly, ten minutes per visit for up to three weeks. During these times, digital drawings, audio recordings of your students speaking during the art making process and video recordings featuring the back of your students' heads, their hands and the researcher, as your students draw on either paper or a tablet will be collected.

- One ten-minute interview in which your students will answer questions about the art making process and about the tablet computer. During this interview, an audio recording of your students speaking will be collected. A video recording will also be collected showing your students' hands as they gesture at several works of art.
- Perhaps one focus group interview with other student participants within the class. Similar questions regarding the art making process and the tablet computer will be asked. Audio recordings of students' voices will be collected.

Approximately ninety-five individuals may be involved in this research. These individuals will include students, parents and educators at the [redacted] Child Development Center.

b) The amount of time involved in your participation will be approximately thirty minutes for completion of the survey, approximately thirty minutes for at least one semi-structured interview and approximately sixty minutes for at least one focus group discussion. Additional time will be spent on the part of the researcher, working within your classroom space for the duration of fifteen weeks, at least once a week, ten minutes per student.

3. While efforts will be made to maintain participants' confidentiality and mask their identities, there is risk of your identity being revealed. All collected data will be digitized and stored on a personal password protected home computer and backed up on an external hard drive as well as in a password protected Dropbox account. Sarah Cress will ensure that all data files are coded with pseudonyms. Only a hardcopy of pseudonym assignments will exist, which will be stored in a locked safe in the researcher's possession. If you would like your real first name to be attached to your data, please contact Sarah Cress directly and let her know of these wishes. Video and audio files will not be shared with participants or shared publicly. Videos may however be shared with a small number of fellow doctoral (no more than five) students whose only mission is to ensure that Sarah Cress is interpreting her data correctly. These individuals will serve as external reviewers. Images of children's artwork may be shared publicly in the form of presentations and papers. After successful completion of the researcher's final dissertation and a few publications, the researcher will destroy all data files by permanently erasing them from all devices (personal computer, external hard drive and Dropbox).

4. There are no direct benefits for your participation in this study, however in exchange for your participation, you will receive digital files of all artwork created by your students.

5. Your participation is voluntary. You may choose not to participate in this research study or to withdraw your consent at any time. You will not be penalized in any way should you choose not to participate or to withdraw. If you choose to withdraw at any point please contact Sarah Cress at 815-342-7899 or sncp63@mail.umsl.edu. Once you contact Sarah Cress and share your wishes, all of your data will be removed from the research set and destroyed. Your students' participation is voluntary as well, and parents

may choose not to let their child participate in this research study or to withdraw their consent at any time. Children who do not provide consent/assent may still work with the tablet computer during normal drawing time, however, they will not participate in interviews or focus group discussions, nor will they produce any collectable data. Videos will not be collected recording these children, nor will audio files. If and when a child who has consented to this research is paired with a child who has not consented during collaborative drawing experiences, their combined artwork and conversations will not be saved for data collection purposes.

6. We will do everything we can to protect your privacy. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your name will not be revealed. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your child's data.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, Sarah Cress (815-342-7899, sncp63@mail.umsl.edu). You may also ask questions or state concerns regarding your rights as a research participant to the Office of Research Administration, at 516-5897.

I have read this consent form and the accompanying cover letter. I have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records.

Educator's Signature	Date	Educator's Printed Name	
Signature of Investigator or Designee	Date	Investigator/Designee Printed Name	

Informational Letter (Educators)
A Tablet Computer in an Early Childhood Setting: A Qualitative Study

Dear Educator,

My name is Sarah Cress and I am a doctoral student at the University of Missouri – St. Louis. While presently pursuing my PhD in education, my background is in art education. I have had experience working with various age groups within the art classroom space and am Nationally Board Certified. Prior to coming to the St. Louis area I taught high school photography in the Chicago suburbs and orchestrated several independent photography programs for students as young as four years old. While I am currently pursuing my own research interests, I also serve as a teaching assistant in the Art Education department at UMSL where I teach pre-service art educators. My life's work has been entirely invested in art education, and this research will help me further explore the field I so passionately love.

I would like to invite **you** and **your students** to be a part of my research. My interests are in regards to tablet computers (like the iPad) and their implications for artistic development. As an educator, if you choose to participate, you will be asked to complete one short survey, which will take approximately thirty minutes to complete at the beginning of the fifteen-week research period. You will also be asked to take part in at least one semi-structured interview and/or focus group discussion at the end of the fifteen-week research period. This may take thirty to sixty minutes of your time. Your students, if they choose to participate, will have class time to draw on a digital tablet, will talk about their drawings, and will take part in collaborative drawing activities. I will visit your classroom once a week for fifteen weeks and allot ten minutes per student to work on the tablet computer.

Please feel free to call or email me if you have any questions or concerns as you read through the attached consent form. In exchange for you and your students' participation in my research you will receive digital copies of all artwork produced during the experience. Thank you so much for your time and consideration. I look forward to hearing from you.

Very Sincerely,

Sarah Cress
Doctoral Candidate
College of Education
GTA Art Education Department
815-342-7899
sncp63@mail.umsl.edu
Skype Call Name: sarahcress
Website: sarahcress.com

Appendix C: Parent Consent Form and Informational Letter

Informed Consent for Participation in Research Activities

A Tablet Computer in an Early Childhood Setting: A Qualitative Study

Parent/Participant's Name: _____
Child's Name: _____

Principal Investigator: Sarah Cress, Doctoral Candidate in the College of Education, GTA in the Department of Art Education
PI's Phone Number: 815-342-7899
PI's Email Address: sncp63@mail.umsl.edu

1. **You** are invited to participate in a research study conducted by Sarah Cress under the supervision of Dr. Louis Lankford. The purpose of this study is to look at how tablet technologies can be utilized during art making experiences. You and your child have been selected because of your association with the [redacted] Child Development Center. The aim of this intervention is to add to the literature concerning technology usage during the pre-school years. This research may provide significant light on tablet computers and their implications for learning. Please read this form and ask any questions you may have before consenting to this study.

2. a.) Your participation as a **parent** in this study will involve

- Completion of one brief survey. This survey will take about thirty minutes to complete and is attached to this form. This survey may be returned to the researcher along with this signed consent form.

Approximately ninety-five individuals may be involved in this research. These individuals will include students, parents and educators at the [redacted] Child Development Center.

b) The amount of time involved in your participation will be approximately thirty minutes to complete the brief survey.

3. While efforts will be made to maintain participants' confidentiality and mask identities, there is risk of your identity being revealed. All data will be stored on a personal password protected computer and backed up on an external hard drive as well as in a password protected Dropbox account. Sarah Cress will ensure that all data is coded with pseudonyms. Only a hardcopy of pseudonym assignments will exist, which will be stored in a locked safe in the researcher's possession. If you would like your real first name to be attached to your data, please contact Sarah Cress directly and let her know of these wishes. After successful completion of the researcher's final dissertation and a few publications, the researcher will destroy all data files by permanently erasing them from all devices (personal computer, external hard drive and Dropbox).

4. There are no direct benefits for your participation in this study. Through this research assertions may be made to the art education community regarding whether or not the digital tablet is a viable tool for art making.

5. Your participation is voluntary. You may choose not to participate in this research study or to withdraw your consent at any time. You will not be penalized in any way should you choose not to participate or to withdraw. If you choose to withdraw at any point please contact Sarah Cress at 815-342-7899 or sncp63@mail.umsl.edu. Once you contact Sarah Cress and share your wishes, all of your data will be removed from the research set and destroyed.

6. We will do everything we can to protect your privacy. By agreeing to participate, you understand and agree that your data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your name will not be revealed unless you state otherwise. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your child's data.

7. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, Sarah Cress (815-342-7899, sncp63@mail.umsl.edu). You may also ask questions or state concerns regarding your rights as a research participant to the Office of Research Administration, at 516-5897.

I have read this consent form and the accompanying cover letter and assent form. I have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my child's participation in the research described above.

Parent's/Guardian's Signature	Date	Parent's/Guardian's Printed Name	
Signature of Investigator or Designee	Date	Investigator/Designee Printed Name	

Informational Letter (Guardians)
A Tablet Computer in an Early Childhood Setting: A Qualitative Study

Dear Guardian,

My name is Sarah Cress and I am a doctoral student at the University of Missouri – St. Louis. While presently pursuing my PhD in education, my background is in art education. I have had experience working with various age groups within the art classroom space and am Nationally Board Certified. Prior to coming to the St. Louis area I taught high school photography in the Chicago suburbs and orchestrated several independent photography programs for students as young as four years old. While I am currently pursuing my own research interests, I also serve as a teaching assistant in the Art Education department at UMSL where I teach pre-service art educators. My life's work has been entirely invested in art education, and this research will help me further explore the field I so passionately love.

I would like to invite **you** and **your child** to be a part of my research. My interests are in regards to tablet computers (like the iPad) and their implications for artistic development. As a parent, if you choose to participate, you will be asked to complete one short survey, which will take approximately thirty minutes to complete at the beginning of the fifteen-week research period. Your child, if they choose to participate, will have class time to draw on a digital tablet, will talk about their drawings, and will take part in collaborative drawing activities. I will visit your child's classroom, with the permission of their classroom teacher, once a week for fifteen weeks. Your child will work with me and the tablet for approximately ten minutes per week.

Please feel free to call or email me if you have any questions or concerns as you read through the attached consent forms. In exchange for you and your child's participation in my research you will receive digital copies of all of your child's artwork produced during the experience. Thank you so much for your time and consideration. I look forward to hearing from you.

Very Sincerely,

Sarah Cress
Doctoral Candidate
College of Education
GTA Art Education Department
815-342-7899
sncp63@mail.umsl.edu
Skype Call Name: sarahcress
Website: sarahcress.com

Appendix D: Child Consent Form and Informational Letter

Informed Consent for Participation in Research Activities

A Tablet Computer in an Early Childhood Setting: A Qualitative Study

Child/Participant's Name: _____
Parent's Name: _____

Principal Investigator: Sarah Cress, Doctoral Candidate in the College of Education, GTA in the Department of Art Education
PI's Phone Number: 815-342-7899
PI's Email Address: sncp63@mail.umsl.edu

1. **Your child** is invited to participate in a research study conducted by Sarah Cress under the supervision of Dr. Louis Lankford. The purpose of this study is to look at tablet computers and their implications for artistic development. Your child has been selected because of their enrollment in the [redacted] Child Development Center. Your child's participation in this research is voluntary. The aim of this intervention is to add to the literature concerning technology usage during the pre-school years. Please read this form and ask any questions you may have before consenting to your child's participation.

2. a.) Your **child's** participation will involve

- Weekly observations in which the researcher will visit the classroom and observe your child and their teacher in action. These observations will average once weekly for the duration of the first three weeks of research. Data will be collected in the form of notes and memos.
- Opportunities in which your child can work one on one with the researcher making digital drawings on a tablet computer, along with some with crayons on paper. These visits will average once weekly, ten minutes per visit for up to six weeks. Digital drawings, scanned copies of drawings made with crayons on paper, audio recordings of your child speaking during the art making process and video recordings featuring the back of your child's head, their hands and the researcher, as your child draws on either paper or a tablet will be collected.
- Opportunities in which your child can work collaboratively with a peer creating drawings on a tablet computer together. These visits will average once weekly, ten minutes per visit for up to three weeks. During these times, digital drawings, audio recordings of your child speaking during the art making process and video recordings featuring the back of your child's head, their hands and the researcher, as your child draws on either paper or a tablet will be collected.
- One ten-minute interview in which your child will answer questions about the art making process and about the tablet computer. During this interview, an audio recording of your child speaking will be collected. A video recording will be collected showing your child's hands as they gesture at several works of their own art.

- Perhaps one focus group interview with other child participants within the class. Questions regarding the art making process and the tablet computer will be asked. Audio recordings will be collected of children's voices.

Approximately ninety-five individuals may be involved in this research. These individuals will include you, in addition to your child, their peers and educators at the [redacted] Child Development Center.

b) The amount of time involved in your child's participation will be approximately fifteen weeks, on average once a week, ten minutes per visit.

3. While efforts will be made to maintain participants' confidentiality and mask their identities, there is risk of identity being revealed. All collected data will be stored on a personal password protected home computer and backed up on an external hard drive as well as in a password protected Dropbox account. Sarah Cress will ensure that all files are coded with pseudonyms. Only a hardcopy of pseudonym assignments will exist, which will be stored in a locked safe in the researcher's possession. If you would like your child's real first name to be attached to their data, please contact Sarah Cress directly and let her know of these wishes. Video and audio files will not be shared with participants or shared publicly. Videos may however be shared with a small number of fellow doctoral (no more than five) students whose only mission is to ensure that Sarah Cress is interpreting her data accurately. These individuals will serve as external reviewers. Images of children's artwork may be shared publicly in the form of presentations and papers. After successful completion of the researcher's final dissertation and a few publications, the researcher will destroy all data files by permanently erasing them from all devices (personal computer, external hard drive and Dropbox).

4. There are no direct benefits for your child's participation in this study, however in exchange for their participation, you will receive digital files of all artwork created by your child.

5. Your child's participation is voluntary and you may choose not to let your child participate in this research study or to withdraw your consent for your child's participation at any time. You and your child will not be penalized in any way should you choose not to let your child participate or to withdraw your child. Children who do not provide consent/assent may still work with the tablet computer during normal drawing time, however, they will not participate in interviews or focus group discussions, nor will they produce any collectable data. Videos will not be collected recording these children, nor will audio files. If and when a child who has consented to this research is paired with a child who has not consented during collaborative drawing experiences, their combined artwork and conversations will not be saved for data collection purposes. If you choose to withdraw your child at any point please contact Sarah Cress at 815-342-7899 or sncp63@mail.umsl.edu. Once you contact Sarah Cress and share your wishes, all of your child's data will be removed from the research set and destroyed.

6. We will do everything we can to protect your child's privacy. By agreeing to let your child participate, you understand and agree that your child's data may be shared with other researchers and educators in the form of presentations and/or publications. In all cases, your child's name will not be revealed, unless you state otherwise. In rare instances, a researcher's study must undergo an audit or program evaluation by an oversight agency (such as the Office for Human Research Protection). That agency would be required to maintain the confidentiality of your child's data.

7. We also do everything to protect your child's safety. Provided that your child will take part in a variety of free drawing activities, if there is any evidence of child abuse, Sarah Cress is mandated to report any drawings in question over to the director of the Child Development Center for further investigation.

8. If you have any questions or concerns regarding this study, or if any problems arise, you may call the Investigator, Sarah Cress (815-342-7899, sncp63@mail.umsl.edu). You may also ask questions or state concerns regarding your child's rights as a research participant to the Office of Research Administration, at 516-5897.

I have read this consent form and the accompanying cover letter and assent form. I have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I consent to my child's participation in the research described above.

Parent's/Guardian's Signature	Date	Parent's/Guardian's Printed Name
Child's Printed Name		
Signature of Investigator or Designee	Date	Investigator/Designee Printed Name

Informational Letter (Minors)

A Tablet Computer in an Early Childhood Setting: A Qualitative Study

The following has been prepared for those children interested in participating in the proposed study. This information is strictly informational. Children may express freely if they would like to participate in the study, however it is not a problem if they do not want to. Please take some time to look over the following with your child. This information may be revisited throughout the research experience to remind children of the purpose of their participation in this research study.

My name is Sarah Cress and I am a student at the University of Missouri – St. Louis. I want to find out more about how you draw and what you like about drawing. I would like to invite you to participate in my research study. During this study I will watch you draw and talk with you about your drawings. I will bring my tablet computer and you can draw on it. We can also draw with crayons on paper. I will use some of your artwork to show others how tablets can be used in school. I may also share some of the stories you shared about your artwork with others. If you don't want to be in this study, you don't have to participate. No one will be upset if you don't want to participate or if you change your mind later and want to stop.

Thank you for your consideration.

Very Sincerely,

Sarah Cress
Doctoral Candidate
College of Education
GTA Art Education Department
815-342-7899
sncp63@mail.umsl.edu
Skype Call Name: sarahcress
Website: sarahcress.com

Appendix E: Parent Survey

1. Do you or other primary caregivers own a tablet computer?

   Please circle one: Yes No

   If you answered yes to question 1, please answer questions 2 through 6. If you answered no to question 1, you may move on to question 7.

2. If so, how often would you say you use your tablet computer on a daily basis?

   Please circle one:

   Very Much Somewhat Neutral Not Really Not At All

3. For what purposes do you usually access your tablet computer?

4. Does your child use your tablet computer?

   Please circle one: Yes No

5. If so, how often would you say your child uses your tablet computer on a daily basis?

   Please circle one:

   Very Much Somewhat Neutral Not Really Not at All

6. For what purposes does your child access your tablet computer?

7. Do you or other primary caregivers own a touch screen phone?

   Please circle one: Yes No

   If you answered yes to question 6, please answer questions 8 through 12. If you answered no to question 6, you may move on to question 13.

8. If so, how often would you say you use your touch screen phone on a daily basis?

   Please circle one:

   Very Much Somewhat Neutral Not Really Not at All

9. For what purposes do you usually access your touch screen phone?

10. Does your child use your touch screen phone?

    Please circle one: Yes No

11. If so, how often would you say your child uses your touch screen phone on a daily basis? Please circle one:

    Very Much Somewhat Neutral Not Really Not at All

12. For what purposes does your child access your touch screen phone?

13. Do you encourage artistic making at home? Please circle one:

    Very Much Somewhat Neutral Not Really Not at All

14. If so, describe some of the materials your child has access to (examples include crayons, colored pencils, paint, clay).

15. Describe the types of things your child likes to create using art materials.

Appendix F: Educator Survey

1. Do you own a tablet computer?

   Please circle one: Yes No

   If you answered yes to question 1, please answer questions 2 through 3. If you answered no to question 1, you may move on to question 4.

2. If so, how often would you say you use your tablet computer on a daily basis?

   Please circle one:

   Very Much Somewhat Neutral Not Really Not at All

3. For what purposes do you usually access your tablet computer?

4. Do you own a touch screen phone?

   Please circle one: Yes No

   If you answered yes to question 4, please answer questions 5 through 6. If you answered no to question 4, you may move on to question 7.

5. If so, how often would you say you use your touch screen phone on a daily basis?

   Please circle one:

   Very Much Somewhat Neutral Not Really Not at All

6. For what purposes do you usually access your touch screen phone?

7. Have you utilized a tablet computer in the pre-school classroom?

   Please circle one: Yes No

8. If so, how have you utilized a tablet computer in the pre-school classroom?

9. Have you utilized a touch screen phone in the pre-school classroom?

   Please circle one: Yes No

10. If so, how have you utilized a touch screen phone in the pre-school classroom?

11. Do you feel the tablet computer has implications for student growth in the pre-school classroom? If so, how? If not, why?

12. Do you feel the touch screen phone has implications for student growth in the pre-school classroom? If so, how? If not, why?

13. Do you encourage art making in the classroom? Please circle one:

    Very Much Somewhat Neutral Not Really Not at All

14. If so, describe some of the materials your students have access to (examples include crayons, colored pencils, paint, clay).

15. Describe the types of things your students like to create with art materials.

16. Describe the style of your students' drawings. (examples include scribbles, basic bodies and shapes, more realistic renderings)

Appendix G: Child Interview Protocol

Each child in the study will participate in at least one ten-minute interview with the researcher regarding their experience working with the tablet. The researcher will make an audio recording of the child's response to the following questions. The researcher may videotape the child's hands in the event that they gesture towards a drawing while speaking. Video will also be collected of the researcher, recording her responses to children's contributions. Time and location of each one on one interview will be at the discretion of each classroom teacher.

1. Can you tell me about this drawing you made? (Here I will reference one of their drawings created on the tablet. This question may be repeated for all other non-collaborative images discussed.)
2. In what ways have we used the tablet computer in this class?
3. What did you enjoy most about using the tablet computer to make drawings?
4. What did you enjoy least about using the tablet computer to make drawings?
5. Can you tell me about this drawing you made? (Here I will reference one of the drawings they created with a peer. This question may be repeated for all other collaborative images discussed.)
6. What did you enjoy most about drawing with your friend on the tablet?
7. What did you enjoy least about drawing with your friend on the tablet?
8. Is drawing on the tablet computer like drawing with crayons? Why or why not?

Appendix H: Child Focus Group Protocol

Each participating class of children may be invited to participate in a focus group discussion. Time and date will be at the discretion of the center's teachers. Focus group sessions will take place during normal school hours at the child development center, one class at a time. During focus group discussions, only audio recordings of the children responding to the following questions will be collected. Video will be collected, but ONLY of the researcher, recording her responses to children's contributions.

1. In what ways have we used the tablet computer in this class?
2. What did you enjoy most about using the tablet computer to make drawings?
3. What did you enjoy least about using the tablet computer to make drawings?
4. What did you enjoy most about drawing with your friends on the tablet?
5. What did you enjoy least about drawing with your friends on the tablet?
6. Is drawing on the tablet computer like drawing with crayons? Why or why not?

Appendix I: Educator Interview Protocol

Educators participating in the study will be asked to take part in a brief interview at the end of the research period, lasting no longer than thirty minutes. Time and location of each one on one interview will be at the discretion of each classroom teacher. During interview discussions, only audio recordings of educators responding to the following questions will be collected.

1. What were your initial thoughts when this study first came to your attention?
2. How do you feel your students responded to the tablet computer as a drawing tool?
3. How do you feel your students responded when asked to collaborate and draw on the tablet with a peer?
4. Do you feel the tablet computer has implications for learning in the pre-school setting? Why or why not?
5. Would you be tempted to use a tablet computer for instruction in the pre-school setting? Why or why not?
6. What are some ways you might use the tablet computer in the pre-school setting?

Appendix J: Reliability Protocol, Phases One Through Three

Please answer the following questions to the best of your ability while reviewing the provided video of researcher, Sarah Cress, as she observes young children interacting with a tablet computer for drawing purposes.

1. Which best describes the body language exhibited by the researcher? (Put a check mark in the appropriate box:

Positive (smiling, open arms, very engaged in what the child is doing)	**Neutral** (blank facial expression, somewhat engaged in what the child is doing)	**Negative** (frowning, arms crossed, not at all engaged in what the child is doing)

Additional explanation (if needed):

2. Which best describes the verbal language exhibited by the researcher? (Put a check mark in the appropriate box:

Overly Involved (providing regular verbal cues that may or may not steer the child's explorations)	**Engaged** (is generally encouraging, provides verbal cues when technical assistance is needed)	**Distant** (does not engage the child in any conversation, nor responds to questions or concerns)

Additional explanation (if needed):

Appendix K: Reliability Protocol, Phase Four (Individual Interviews)

Please answer the following questions to the best of your ability while reviewing the provided video of researcher, Sarah Cress, as she interviews young children regarding their experiences with the tablet computer.

1. Which best describes the body language exhibited by the researcher? (Put a check mark in the appropriate box:

Positive (smiling, open arms, very engaged in what the child is saying)	**Neutral** (blank facial expression, somewhat engaged in what the child is saying)	**Negative** (frowning, arms crossed, not at all engaged in what the child is saying)

Additional explanation (if needed):

2. Which best describes the verbal language exhibited by the researcher? (Put a check mark in the appropriate box:

Overly Involved (Researcher discussion goes beyond interview questions and provides regular verbal cues that may steer the child's discussion)	**Engaged** (Researcher sticks to planned interview questions and allows the child to do most of the talking. Few follow-up questions are asked.)	**Distant** (Researcher asks only planned interview questions.)

Additional explanation (if needed):

Appendix L: Reliability Protocol, Phase Four (Focus Group Discussions)

Please answer the following questions to the best of your ability while reviewing the provided video of researcher, Sarah Cress, as she interviews young children regarding their experiences with the tablet computer.

1. Which best describes the body language exhibited by the researcher? (Put a check mark in the appropriate box:

Positive (smiling, open arms, very engaged in what the child is saying)	**Neutral** (blank facial expression, somewhat engaged in what the child is saying)	**Negative** (frowning, arms crossed, not at all engaged in what the child is saying)

Additional explanation (if needed):

2. Which best describes the verbal language exhibited by the researcher? (Put a check mark in the appropriate box:

Overly Involved (Researcher discussion goes beyond interview questions and provides regular verbal cues that may steer the child's discussion)	**Engaged** (Researcher sticks to planned interview questions and allows the child to do most of the talking. Few follow-up questions are asked.)	**Distant** (Researcher asks only planned interview questions.)

Additional explanation (if needed):